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The Crippled Colon

*Causes, Consequences,
Remedies*

By

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By

JOHN HARVEY KELLOGG

PREFACE

In the preparation of this work, nineteen years ago (1912), under the title "Colon Hygiene," the writer undertook to present a summary of the highly illuminating facts respecting the colon, both in health and disease, that had then recently been disclosed by the X-ray studies and special researches conducted by Cannon, Hurst, Holzkecht, Case and others. This new knowledge had enabled the writer to develop a new therapeutic program, which had been extensively employed at the Battle Creek Sanitarium with highly successful results.

Several of the deductions from this new knowledge were widely at variance with current medical teaching. Among these was the requirement that elimination of the alimentary residues and body wastes through evacuation of the bowels should occur after each meal or three times daily. It was pointed out that Nature has provided, in the several mechanisms connected with the colon function, means for such prompt elimination of residues that food remnants and other wastes need remain in the body no longer than twenty-four hours and that in general they may be evacuated in even less time. It was maintained that this prompt elimination of wastes and residues is necessary to prevent decomposi-

tion processes and the absorption of damaging putrefaction products.

It was insisted that this increased activity of the colon should be secured by purely physiologic or biologic means; that is, by means of diet and dietetic accessories calculated to increase stimulation by bulk and to provide lubrication, and without causing irritation, either mechanical or chemical.

The idea that the colon becomes torpid or "lazy" and needs to be punished or goaded to increased activity is a most pernicious error which has been the cause of an inestimable amount of injury through the use of vast quantities of cathartics and laxative drugs and floods of mineral waters. The colon, perhaps the most abused organ in the body, is never lazy; but the civilized colon has become so badly crippled by mistreatment that it is almost universally in need of help.

Great emphasis was laid upon the need of keeping the colon free from putrefying residues. In opposition to the teaching that the colon should be sacrificed and removed, it was urged that the crippled organ should be reformed and by proper assistance made to perform its duty in a normal and efficient manner. Also, great importance was attached to change of the intestinal flora and the maintenance of a protective, non-putrefactive condition, thus giving dietetic

measures preëminence in the therapeutic program.

In spite of the opposition of certain ultra conservative medical writers, the importance of colon poisons as a factor in the causation of functional and organic disease has steadily found more and more general recognition as the result of the very striking clinical results which often follow the suppression of these toxins. The practical clinician no longer doubts the reality of autointoxication and the supreme importance of reducing to a minimum the toxins with which the body has to deal by securing the prompt dismissal of wastes and residues.

In the preparation of this little volume, the writer has had in mind both the medical practitioner and the intelligent layman, but without the intention of encouraging the sick man to manage his own case, since even the most skilful of physicians recognizes the necessity for seeking expert advice when ill. Rather, the aim has been to present the subject in such untechnical terms that the non-medical reader may acquire information sufficient to enable him to coöperate intelligently with the up-to-date physician in combating colonic stasis and chronic intestinal infections.

An increasing number of progressive practitioners, attracted by the simplicity and rationality of the new teaching, have thought it worth while to make practical trial of the methods and

measures suggested—and with such results as have made them enthusiastic advocates of the physiologic method of dealing with colonic troubles—and the new therapeutic procedures have found an increasing number of adherents from year to year.

In several state hospitals for the insane, the adoption of the antitoxic regimen and methods for changing the intestinal flora and increasing colonic efficiency, has led to most gratifying results. One large state hospital reports the number of recoveries under the new régime to be two and a half times as great as under the old.

The extensive changes and additions made in the rearrangement and rewriting of the text of this edition, seem to the writer to justify a change of title. It is also hoped that the new title will to some degree assist in correcting the false idea that a damaged and crippled colon is "lazy."

JOHN HARVEY KELLOGG, M.D.

Battle Creek, Michigan, U.S.A., April, 1931.

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The Crippled Colon

INTRODUCTION

Neglect of the colon is one of the major sins of civilization. The influence of this neglect is far-reaching, and responsible not only for physical disasters of appalling magnitude, but for business failures and mental and moral catastrophes, the wreckage of which may be seen in our divorce courts, bankruptcy auction sales and overcrowded prisons and insane asylums.

The colon of the average civilized person has been so long neglected and abused, constipation has come to be regarded as the normal state. If the colon evacuates once daily a mass of loathsome rubbish that has been lying in its interior seething with putrefaction for from two to four days, or more, the bowels are thought to be normal and regular. The semi-solid mass of fecal residues that has been retained so long that it has become desiccated and molded to the shape of the over-distended bowel is accepted as a sign of health, and is known as "the well-formed stool" of classic medical literature, although in itself it presents the most positive evidence of constipation.

Through generations of neglect this evil has grown until it has become a menace to civilization, and has been appropriately called by Dr. W. Arbuthnot Lane, the famous London surgeon, "The White Man's Burden." Something of an idea of its proportions may be judged from the following statistical facts, quoting an able contributor to *The Archives of Pediatrics*:

"The expenditure in the United States for cathartic drugs amounts to over fifty million dollars a year (1925). The Metropolitan Life Insurance Company recently examined sixteen thousand one hundred and sixty-two male policy-holders presumably in good health. Constipation was found in thirty-nine and seven-tenths per cent and hemorrhoids in twelve and three-tenths per cent. Sansum of Santa Barbara College Hospital states that his records show that more than eighty-five per cent of the patients who come to him are constipated, and that if this condition is cured, *more than fifty per cent are cured of all their complaints.*"

The civilized colon needs to be speeded up. It is one to three days behind time. The use of salines, mineral waters and drugs of various sorts as colon stimulants has proved not only unsuccessful but most disastrous, by the production of more aggravated forms of constipation and a vast army of victims of colitis, the *bête noire* of the gastro-enterological specialist under the old therapeutic régime. Multitudes of suf-

ferers from colon troubles have, through disappointing experiences, been led to despair of finding any way of escape from their slavery to after-dinner pills and morning salines.

But constipation is curable. The biologic method, based upon the new knowledge of colon physiology, has proved its efficiency. The hopeless view that constipation is incurable, generally held by the laity as well as by many physicians, is the natural result of attempts to cure that have failed, due to a lack of scientific information regarding its chief causes. The new knowledge needed is now available.

There is perhaps no important bodily function that is so much neglected, and with such damaging results, as defecation or bowel movement. This wrong attitude toward one of the most important functions of the body is in large part responsible for the almost universal existence of constipation among civilized people, and of widespread and most appalling evil consequences.

The savage knows that there are dangers in the body residues. He refuses to drink "raw" water because too often it is polluted with poisons that make him sick. He sours his milk in a gourd in order to protect this important food from putrefactive changes—that is, from pernicious bacteria, such as are found in body residues. And, when the soil about his village becomes polluted with accumulating refuse, he moves to a clean locality.

Civilized man becomes so firmly rooted that he cannot easily remove his domicile or his workshop in order to escape from putrefactive bacteria. Modern sanitary science long ago showed him how to get rid of filth, garbage and other refuse, by the aid of sewers and garbage-disposal systems. But by far the greatest dangers from residues develop before they leave the body—that is, while they are stagnating in the large intestine.

We instinctively avoid contact with loathsome bowel discharges but overlook the fact that these repulsive putrefying residues when in the body were equally as filthy and noisome, although out of sight, and were inflicting upon the body just the same injury that they would do if they were put back into the body after having been discharged.

Bouchard's work a third of a century ago, clearly demonstrated the toxic properties of the fecal residues, and provided a sound scientific basis for the doctrine of autointoxication. His teaching has had a greater influence, and has led to greater progress in practical clinical medicine than that of any other modern writer.

THE FOOD TUBE

Until very recent years little was known of the physiology of the colon. The physiology of digestion ended at the ileocecal valve. The studies by Elliot, Keith and other anatomists and physiologists of the intestine in dogs, and the X-ray studies of the colon in cats by Cannon, confirmed and extended in human beings by Holzknecht, Schwartz, Hurst, Case and others, gave us the key to an understanding of the normal functioning of the colon, thereby providing a standard by which to check the findings in diseased conditions.

The combined results of these extensive labors of many investigators have thrown a flood of light upon some of the most obscure questions in physiology and led to the discovery of more efficient means of remedying constipation, one of the most common ailments to which civilized man is subject, a disorder not only in itself a grave affliction but a veritable mother of maladies and miseries, physical, mental and oftentimes moral.

Ignoring technical anatomical details, the food canal may be described as a muscular tube about five times the length of the body. For the greater part of its length the canal is narrow and is known as the small intestine, the chief organ of digestion.

The terminal portion of the canal widens out to form the large intestine, or colon, a pouch well designed to receive and dispose of the food residues and body wastes.

When in its normal position, the colon begins at the lower right-hand section of the abdominal cavity. Its head, a pouch much broader than the rest of the colon, lies in the hollow of the right iliac bone.

The small intestine joins the large intestine about an inch and a half above this lower end, leaving a shallow pocket, the *cecum*, to which is attached the *appendix*.

At the point of junction of the small intestine with the cecum, an infolding of the intestinal walls forms a check valve, which prevents reflux into the small intestine, the ileocecal valve.

From the cecum, the large bowel passes upward to the liver, then crosses the body to the spleen, where it turns sharply downward. These three sections are known respectively as the *ascending*, the *transverse* and the *descending* colon (see illustration).

Passing obliquely across the inner surface of the left iliac bone, the large intestine, here

called the *iliac colon*, reaches the upper border of the pelvic cavity. Here it forms a loop, the *pelvic colon*. The pelvic colon and iliac colon together form an S-shaped section, sometimes called the sigmoid.

The intestine is covered through most of its course with a delicate membrane, the *peritoneum*. It is lined with mucous membrane, which presents at various points special groups of glands that produce some of the digestive juices that act upon the food.

The intestine is attached to the spine by a membrane, the *mesentery*, in which pass the nerves and blood vessels that supply the tube. It has two sets of muscle fibers. One set, the outer, runs lengthwise. An inner set consists of circular fibers, which surround the intestine throughout its entire length.

The small intestine is a smooth tube of uniform size, but the large intestine is sacculated. By a thickening of its muscular structures at intervals, shallow pouches are formed in its sides.

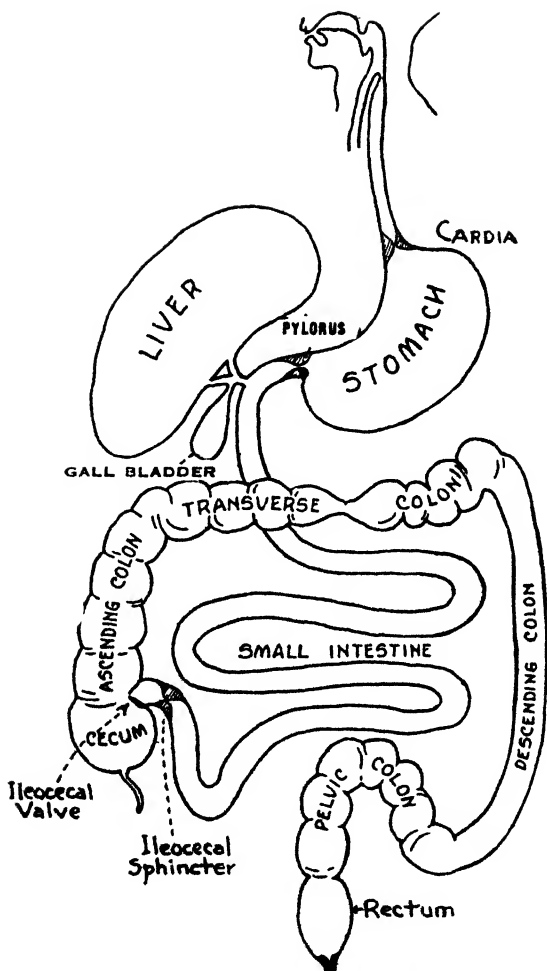
The thick bands of muscle tissue on the outer surface of the colon act in defecation like gathering strings. In contracting, these bands draw the lateral pouches together, so as to empty them of their contents. These sacs or pouches are well shown in the accompanying stereoradiogram, a rare view of the colon for which the writer is indebted to Dr. James T. Case.

If the reader will take the trouble to study this view of the colon, he will feel richly rewarded by the striking delineation of this most troublesome viscus.

The Pacemakers

Keith, the eminent English anatomist, discovered facts of great interest in relation to the control of the movements of the alimentary canal or food tube. He showed that the muscular structures of the intestine have the same property of rhythmic action as is possessed by the muscle fibers of the heart. This tendency to rhythmic movement of the individual fibers is organized into an orderly action by certain nerve centers or nodes that function as pacemakers. These centers are placed at intervals along the alimentary tract, thus dividing it into sections.

According to Keith, the mouth constitutes the first section, defined by a sphincter or circular muscle at the upper end of the esophagus. At the lower end of the esophagus, where it joins the stomach, is a second sphincter. The pylorus is the third sphincter. Still another sphincter is found at the junction of the duodenum and the small intestine. A fifth sphincter is found at the end of the small intestine just above the ileocecal valve. Near the middle of the transverse colon is a sixth node. At the junction of the colon with the rectum is



THE FOOD TUBE OR CANAL

found the seventh. And lastly, the sphincters ani close the lower end of the intestine.

This new conception of the intestinal tract set forth by Keith compares the intestinal canal to a railroad that is divided into block sections, each section being controlled by its own signal man, who refuses to allow a second train to enter his section until it is cleared by the passing on of the train then present.

This reflex effect is most important as an aid to the understanding of symptoms. In a railway system, when a wreck causing obstruction occurs at some point on the line, a message is sent back to slow up or stop traffic until the track is cleared. The intestinal tract behaves in a similar way. When there is stagnation (technically called stasis) in a section, there is slowing or stoppage of forward movement of material in the preceding sections, and sometimes a reversal of movement. This is a common reason for loss of appetite, and the explanation of nausea and vomiting in many cases.

This embargo affects profoundly not only the intestine but the nervous system and even the psychic functions. This fact explains, in part at least, the sense of fatigue, mental confusion, indecision, depression, apathy, the sense of ineffectiveness and of ineptitude, often complained of by constipated persons, and the immediate relief experienced when the embargo is raised.



Stercoradiogram of Normal Colon, Showing Pouches
(To be Viewed with a Stereoscope)

Nerve Control

The food tube is controlled by two sets of nerves. One, the motor, excites contractions of the intestine, while the other opposes this action, causing cessation of movements and relaxation of the intestine. The motor nerves are derived from the brain and spinal cord; those of the second class, from the sympathetic.

Two remarkable and interesting facts relating to the action of these nerves should be mentioned here as an aid to a full understanding of their action. When the motor nerves of the intestine are stimulated, they cause powerful contraction of both the intestine and the abdominal walls, but relaxation of both the internal and external anal sphincters. When the sympathetic or splanchnic nerves of the intestine are stimulated, they cause relaxation of the intestines, with cessation of movement, and at the same time strong contraction of the ileocecal sphincter. These facts explain many important phenomena in relation to bowel movement. The relaxation of the anal sphincters, when the colon and abdominal muscles contract, is necessary to facilitate the discharge of feces from the bowels. This fact wholly agrees with the interesting observations of Bayliss and Starling, that mechanical excitation of the intestine causes contraction at and above the point of irritation and relaxation below.

Colon Movements — Peristalsis

The colon has movements peculiar to itself—four very distinct modes of action or peristalsis. These are:

1. *Molding movements*, by which the contents are slowly compressed and molded. These movements are almost too slow to be noticed by the eye in X-ray examinations except by observations made at intervals of a half hour or more.

2. *Propulsive movements*, by which the colon contents are passed along so rapidly that the eye cannot follow them. Movements of this sort occur regularly when the bowels are evacuated and also at other times.

3. *Snake-like movements* (originally described by Roeder, of Germany) in which the transverse colon moves in a manner resembling the contractions of a serpent. From this he concludes that the position of the transverse colon, unless it is held fast by adhesions, is not a definite one and is not a matter of much importance.

Reverse Peristalsis

4. The fourth movement of the colon is in a reverse direction. The theory of anti-peristalsis, first suggested by O'Bierne more than a century ago, accords well with the facts of clinical experience, and may now be recognized as fully established, especially since anti-peristalsis has actually been seen in man by numerous observers.

Observations reported by Boas show that a slight anti-peristaltic movement extending from the colon to the stomach is very frequent. Charcoal and various pigments introduced into the rectum at night in fasting persons may sometimes be found in the stomach the next morning in cases in which the ileocecal valve is incompetent.

Reverse peristalsis has also been studied in cats by Cannon. The movements occur rhythmically and systematically while the contents of the cecum are fluid in character. They serve both to prevent sudden and frequent discharge of the bowel contents, as in diarrhea, and also to churn the contents of the cecum, thus bringing every portion in contact with the walls of the gut so that absorption may be assisted.

The tight closure of the ileocecal valve alone prevents the liquid contents of the cecum from being forced by the anti-peristaltic waves backward into the small intestine. At intervals the anti-peristaltic waves cease momentarily, while the ileocecal valve relaxes, and small portions of material are passed into the cecum from the small intestine. Then the anti-peristaltic waves again begin, churning the liquid material, while at the same time exerting a pumping action upon the venous and lymphatic vessels, so that the contents of the cecum are rapidly concentrated to the proper consistency.

The Normal Ileocecal Valve

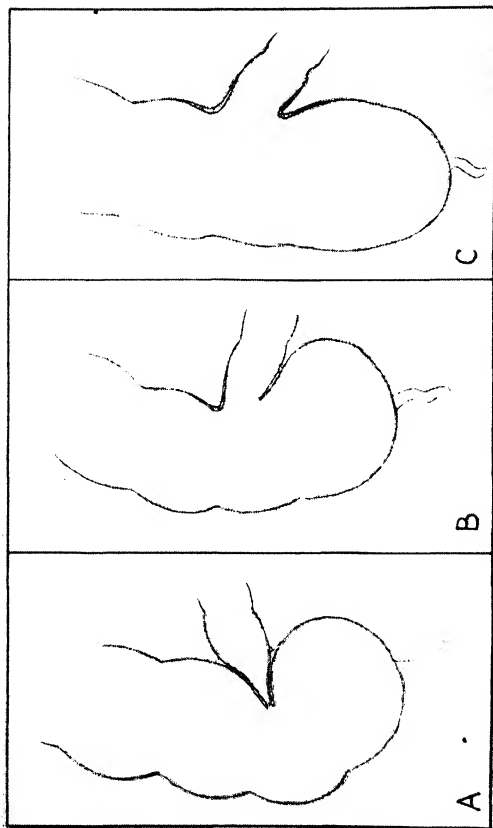
The ileocecal valve is an extremely interesting and important anatomical structure that, though known to science for three hundred and fifty years, has received almost no attention until very recently. It was discovered by Servius in 1563, A.D., and has been described by numerous anatomists, but until recently was regarded rather as an anatomical curiosity with no very important function.

The valve consists of two parts, a sphincter muscle and a two-lipped check valve. The sphincter is formed by a thickening of the circular muscle fibers of the small intestine at its junction with the colon.

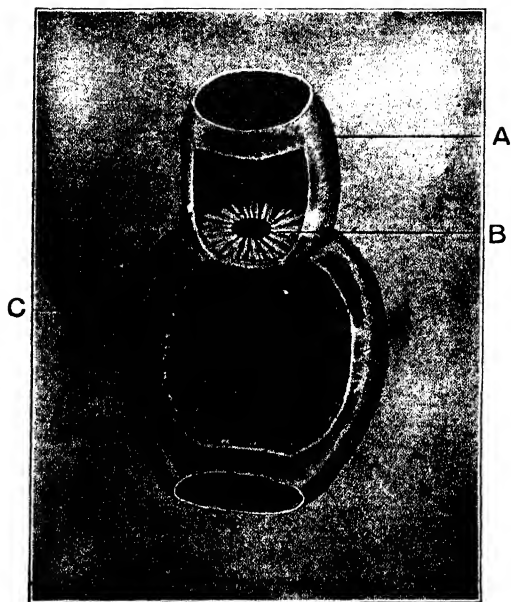
X-ray observations by Cannon have clearly demonstrated that the ileocecal sphincter acts in a manner very similar to the pylorus, retaining the foodstuffs in the small intestine until the digestive work of the mid-gut is complete and the digested foodstuffs have been absorbed.

The check valve is formed by an invagination of the small intestine into the colon. An idea of the structure of the valve may be formed from the accompanying illustration.

Within the last few years Holzknrecht, Schwartz, Groedel, Case and numerous other roentgenologists have clearly demonstrated the functional activity of the ileocecal valve in controlling the movements of foodstuffs from the



A. Normal Ileocecal Valve B. Partially Incompetent Ileocecal Valve
C. Wholly Incompetent Ileocecal Valve



Ileocecal Valve of a Conger Eel
A. Ileum; B. Ileocecal Valve; C. Colon

small intestine into the colon. These observations establish the necessity of the ileocecal valve for the following purposes:

1. To hold back the material in the small intestine until the digested portion has been transformed by the several digestive juices, and absorbed.

2. To pass the mixture of unusable food residues, mucus, bile and other excretions, from the small intestine into the colon in small successive doses, so as to give the colon—the chief function of which is the absorption of water and the discharge of unusable food residues and excreta—an opportunity to deal with the material brought to it without being overloaded.

3. To prevent a reflux of material from the colon into the small intestine.

The Incompetent Ileocecal Valve

Incompetency of the ileocecal valve may be due either to mechanical defect or to inefficiency of the ileocecal sphincter. Or, both structures may be involved.

From the observations of Elliot, it would seem to be quite possible that the sphincter is the most important element of the valve, and that the check valve structure is often lacking. It would seem to be quite possible, also, that incompetency of the valve may be often, if not generally, the result of inefficient action of the ileocecal sphincter, which in turn may be due

to nervous disturbance or to mechanical injury resulting from overdistention of the cecum, a condition usually found present when the valve is to a marked degree incompetent. This overdistention may be due to the accumulation of liquid or solid material, or it may be produced by the development of an excessive amount of gas through the putrefaction and fermentation of retained fecal matters.

Constipation is a natural consequence of incompetency of the ileocecal valve. But incompetency of the ileocecal valve may also cause constipation, or at least greatly aggravate this condition, by interfering with the forward movement of the intestinal contents. The integrity of the valve is absolutely essential for positive movement of the intestinal contents in the forward direction. The powerful anti-peristaltic or reverse movements of the colon necessitate the thorough protection of the ileum against reflux. When the ileocecal valve is incompetent, this protection is lost. The contents of the cecum, instead of being churned and mixed by the reverse movements, are forced back into the small intestine. The intestinal contents are thus prevented from advancing in the normal way, and are held in the cecum and terminal ileum, where absorption is rapid. The result of this delay in the terminal ileum is the absorption of an excessive amount of the water from the residues, so that they become too dry and

hard, semi-solid in consistency. The lower ileum and cecum, being adapted to the handling of liquid matters, are not prepared to deal with this heavy material. The residues therefore stagnate in the lower ileum and cecum. They are only slowly moved along the colon, and when discharged resemble the droppings of sheep.

Such fecal masses may often be felt in the cecum by external examination, usually giving to the examining fingers the impression of a mass of putty, although the consistency may be lesser or greater, according to the length of the delay. In these cases X-ray examination may show retention of bismuth for several days in the cecum or some other part of the colon.

The drag of this accumulated material upon the root of the mesentery, as first pointed out by the late Dr. Byron Robinson of Chicago, produces obstruction at the junction of the duodenum and jejunum, and so causes duodenal and gastric stasis. Cannon has demonstrated that dilatation of the duodenum causes closure of the pylorus and thus produces stasis of the stomach.

The natural consequence of stasis in these parts, as in every other part of the alimentary canal, is the abnormal development of bacteria and their toxins. Colitis, pericolitis or appendicitis may result, and the way may be prepared for the development of tuberculosis and cancer, pathological conditions that occur with special frequency in this part of the alimentary canal.

Absorption

The small intestine is the seat of the principal digestive processes, and therefore is the principal organ of absorption of the digested foodstuffs. It absorbs daily five or six quarts of liquids and all the products of digestion. It is, in fact, the one great avenue for the intake of nutrients, both solid and liquid. The colon normally absorbs daily only 10 ounces of fluid, that is, only one-twentieth of the amount absorbed by the whole intestine.

The food normally enters the first part of the colon, or the cecum, in a nearly fluid state, its composition being ninety per cent water and only one-tenth solid matter.

About four hours after a meal, bubbling and squirting sounds may be heard distinctly when the ear is placed over the right lower abdomen, and an hour or two later it is easy to produce splashing and gurgling sounds by intermittent pressure over the colon low down on the right side, showing that a considerable amount of fluid has passed from the small intestine into the cecum.

It should be remembered that this is not a merely mechanical process. The fluid food does not pass by gravity from the small bowel into the large intestine, as water might trickle from a pipe into a reservoir. The opening of the small intestine into the colon is controlled by



Reverse Peristalsis



Incompetent Ileocecal Valve

X-Ray Views of the Food Tube

the ileocecal sphincter acting with the ileocecal valve. This circular muscle holds the food in check in the lower part of the small intestine long enough to make sure that digestion is complete and the absorption of digested foodstuffs practically finished.

In the cecum and ascending colon the food is detained by reverse peristalsis, so that its fluid portion may be absorbed, thus increasing the consistency of the bowel contents. Gradually a portion of the water is taken up by the absorbents, and at regular intervals the more solid portions are pushed along toward the upper end of the ascending colon, the fluid part dropping back into the cecal pouch for absorption.

During the passage of the foodstuffs through the twenty-two feet of small intestine, the digestible carbohydrates, fats and proteins are rendered soluble by the digestive fluids and are practically completely absorbed. The solid parts left to be passed into the colon consist of food remnants, bile, waste products excreted by the intestine, mucus and countless numbers of bacteria, living and dead.

Function of the Pelvic Colon

At the lower end of the food canal is found a mechanism that is wonderfully designed to receive and discharge from the body the unused remnants of the food and other waste materials—the pelvic colon.

The pelvic loop of the colon, which with the iliac colon forms the sigmoid, constitutes the motive part of the mechanism by means of which the residues are discharged from the body. This loop of intestine, when empty, lies low down in the pelvis, the lower end of the loop where it joins the rectum being closed by a sharp fold. The pelvic loop fills as the residues slowly accumulate. As it fills, the loop gradually rises, finally reaching a point at which the residues can enter the rectum. As the rectal walls become distended by the accumulation of feces, the defecation center is stimulated and powerful nerve impulses are sent out that cause the pelvic loop to contract, thus compressing its contents just as one compresses the contents of a rubber bulb by squeezing it with the hand.

The contraction of the pelvic loop is normally so vigorous and complete that it is fully emptied of its contents. The contraction of the descending colon which occurs at the same time is sufficiently strong to carry the contents of the descending and iliac colon into and through the pelvic loop, so that the left half of the colon, from the splenic flexure to the anus, is emptied in defecation. At the end of the contraction, the pelvic loop—or at least the mucous lining of the loop at its lower end—may be pushed down into the rectum like a piston, thus ensuring complete emptying of the rectum. The ac-

tion of the pelvic colon resembles that of a bulb and piston combined, the upper part acting like a compressing bulb while the lower part serves as a piston, thus forming a surprisingly effective discharging mechanism.

The Rectum

The rectum is the terminal portion of the food tube. It is about six inches in length. In its upper part are two or three projecting folds of membrane known as Houston's valves. The lower end is guarded by two sphincter muscles. Just above the internal sphincter is found a series of raised points or papillae, first described by Horner of Philadelphia many years ago. These papillae are the terminal points of special nerves which, when excited, cause powerful contraction of the colon, abdominal muscles and diaphragm, and complete relaxation of the anal sphincter.

Here are also a number of shallow pockets in the mucous membrane, the follicles of Horner. Their function is to secrete a lubricating mucus. Both follicles and papillae sometimes become inflamed and a source of pain.

Surrounding the rectum are two muscles that act an important part in defecation, the levator ani muscles. In contracting, these muscles pull the anus upward and compress the rectum, and so squeeze out the last particle of residues, leaving the rectum completely empty.

NORMAL BOWEL ACTION

The evacuation of the bowels is accomplished by means of seven distinct actions, three of which are voluntary and four automatic. Arranged in the order of natural sequence, the following are the several acts that together accomplish normal bowel movement:

1. Descent of the diaphragm and compression of the bowels, accomplished by taking a deep breath.

2. Voluntary contraction of the abdominal muscles, increasing the compression.

3. Pressure of the thighs against the abdominal wall. The natural position in moving the bowels is not sitting, but crouching or squatting, the position universally employed by savages and by persons in pioneer rural communities.

The result of these three voluntary efforts is to force a portion of the contents of the pelvic colon into the rectum, the distention of which gives rise to stimulation of the defecation center of the sympathetic nervous system by means of which the four involuntary or automatic movements in defecation are brought into action, consisting of the following:

4. Reflex contraction of the abdominal muscles, reinforcing the voluntary contraction.

5. Contraction of the colon. The descending and pelvic colons are chiefly active, although sometimes the whole colon contracts.

6. Reflex relaxation of the anal sphincters, in obedience to the general law that holds throughout the entire digestive tube, by virtue of which a wave of contraction passing along any portion of the canal is immediately preceded by a wave of relaxation.

7. Contraction of the levator ani muscles that surround the rectum and contract at the end of defecation for the purpose of forcing out the last remnants of fecal matter, so that the rectum may remain empty until another movement occurs.

If the diaphragm contracts insufficiently from weakness, tight belts, adhesions, or any other cause, or if the abdominal muscles are weak as is very often the case among civilized people, and if the position assumed in evacuating the bowels is such that the abdominal walls are not compressed by the thighs, the result may be that the rectum is not filled sufficiently to stimulate the defecation center, and so the reflex necessary to set in operation the automatic movements that empty the bowel are not produced.

Any influence that interferes with a single one of these seven steps in the normal process of defecation may give rise to constipation, and when the disturbing influence is of such character as to interfere with several factors, the result

is certain to be an extremely obstinate form of colon inactivity.

The causes of constipation may become operative either before or during the action of defecation. In order that normal defecation should occur, it is necessary that fecal matters reach the pelvic colon in condition to be expelled from the body and that the pelvic colon should be free to rise out of the pelvis so that it may discharge a part of its contents into the rectum, and it is then essential that there be no interference with any of the several factors that enter into the normal act of defecation.

The "Call"

The act of defecation is called forth by a sensation of fullness in the lower part of the colon. In a state of health we ordinarily perceive the sensation only near the extremity of the alimentary canal.

At the upper end of the food tube, guarding the entrance to the esophagus, there is located a reflex that controls the intake of food and liquids. There are nerves in the mucous membrane at the back of the throat that, when stimulated by the contact of foods or liquids, give rise to the swallowing movement in which the esophagus opens. Food or liquid present in the throat is drawn in by a strong suction movement. The act of swallowing is impossible without the

contact of something that may be swallowed. Similarly, at the other end of the food tube, within a few inches of the anus—that is, at the upper part of the rectum—are found nerves that, when stimulated by the contact of fecal matters, give rise to a peculiar sensation recognized as a warning that the bowel contents should be discharged from the body.

During sleep, the intestinal movements are slowed; the progress of the intestinal contents along the canal is at a much slower rate than during the waking hours. This is easily shown by X-ray observations after a bismuth meal. At the moment of awaking, all the bodily movements are quickened. The heart beats faster, the force of the breathing is increased, the whole vital machine feels the impulse of quickened energies. If the pelvic colon has slowly been filling during the night, the various influences that are brought into play at the moment of awaking or arising will be likely to cause the passage of a sufficient quantity of feces from the pelvic loop into the rectum to produce a "call" and an evacuation.

The act of swallowing a glass of water, especially the drinking of cold water, as well as the taking of food, by setting up peristaltic movements, may produce a "call," provided there is at the time a quantity of feces in the pelvic loop. If the loop is empty, food taking or anything else that sets up intestinal peristalsis will serve

to help the residues along toward the pelvic colon, thus leading to a "call" a little later.

The Digestive Time-Table

The X-ray shows that the food reaches the ileocecal valve within three or four hours after it is eaten, gradually accumulating in the lowest coils of the ileum, where it remains until digestion is completed and the digested foodstuffs absorbed. When this has been accomplished, the ileocecal sphincter relaxes at intervals, allowing portions of the residues to pass into the cecum until the ileum is completely emptied.

Cannon, in his work entitled "The Mechanical Factors of Digestion," has shown that practically all the digestible food taken at an ordinary meal is digested and absorbed within eight or nine hours from the time it is eaten, and that the unusable residue at the end of this period is found deposited in the colon, ready for ejection. It thus appears that if breakfast is eaten at 8 A.M., the residues of the meal may be evacuated before retiring at 10 P.M.

The following table shows, according to Rosenheim, the time required for the food to reach the succeeding sections of the alimentary tube, reckoning from the time the food is eaten, since it is known that food begins to pass out of the pylorus very soon after the beginning of a meal:

Cecum	4 hrs.
Hepatic flexure.....	6 hrs.
Splenic flexure	8 hrs.
Iliac colon	9 hrs.
Pelvic colon.....	10 hrs.
Rectum and evacuation--	16 to 18 hrs.

When all parts of the digestive tube are doing their work efficiently, the residue of each meal is dismissed after the second meal following. That is, the food residues from the breakfast should be discharged by a bowel movement between supper and bedtime. The following is the order of the food procession:

Breakfast leaves the stomach and reaches the lower part of the small intestine in four to five hours. The vigorous activity set up by the taking of dinner pushes the breakfast residue over into the colon, the middle part of which is reached within six or eight hours. Between dinner and supper, the breakfast residue slowly works along to the lower end of the colon. When supper is eaten, the new and vigorous peristaltic waves started in the stomach sweep the dinner residue into the colon, and should carry out of the body the breakfast residue already waiting close to the outlet to be dismissed.

During the night, the dinner residue works slowly along the colon to the lower end, and the supper residue passes over from the small intestine into the colon. The stimulus of awaking

and the effort of arising often produce before breakfast a bowel movement by which the dinner residue of the day before is evacuated.

After breakfast, the supper residue is dismissed. The strong peristaltic waves set up by the meal should completely empty the colon.

Intestinal Motility — The Carmin Test

The length of time being taken for the passage of material through the alimentary canal may readily be ascertained by the administration of some substance that will give to the intestinal contents a decided color that can easily be recognized. Powdered charcoal, carmin and even highly colored fruit, such as the huckleberry, may be used for this purpose. It is necessary, of course, while taking the test, that care be used to avoid taking foods of such a color as might lead to confusion with the color of the test substance.

In applying the test, two capsules containing five grains each of carmin are usually given at breakfast, say at 8 A.M. Each stool is afterwards examined, and the time noted when the red color of the carmin appears. The examination of the stools continues until the color disappears. This disappearance time is also noted.

In a normal person the color makes its appearance in about twelve hours from the time it is taken, and should disappear within twenty-

The Alimentary Procession as Shown by the X-Ray

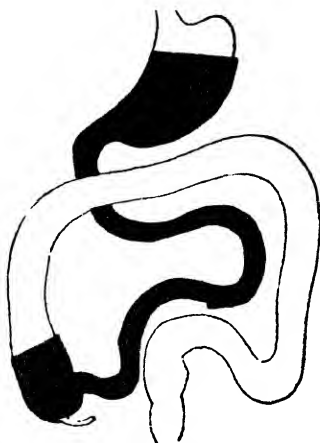
BREAKFAST

DINNER

SUPPER



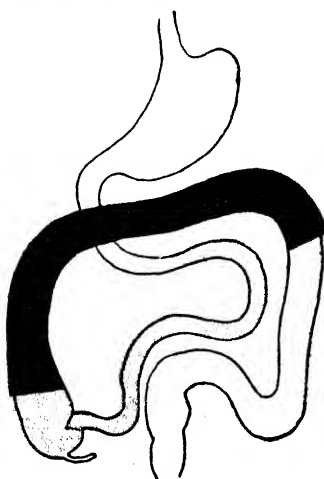
After Breakfast—8 A.M.



After Dinner—1 P.M.
Breakfast residue entering the colon.



After Supper—6 P.M.
Breakfast and dinner residue in the colon. Breakfast residue ready to be discharged.



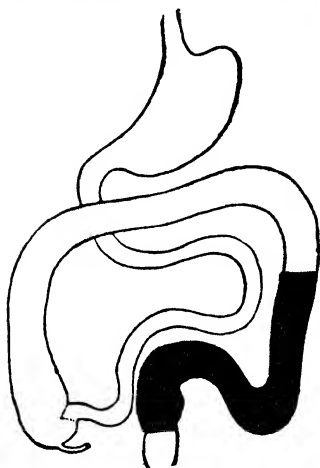
10 P.M. — Breakfast residue discharged before going to bed. Supper residue beginning to enter the colon.

The Alimentary Procession as Shown by the X-Ray

BREAKFAST

DINNER

SUPPER



Before Breakfast—2nd Day
Dinner residue of the day before ready to be discharged.



After Breakfast—2nd Day
Supper residue ready to be discharged, thus clearing the way for the day's meals.



"One-a-Day" Constipation



Colitis

five hours after eating. It should be borne in mind that it is the disappearance that is of chief significance.

In a few fortunate persons, the color appears in less than twelve hours and disappears in eighteen hours or even less. It is probable that the shorter periods mentioned are more nearly the normal, and that the periods of twelve hours for appearance and twenty-five hours for disappearance should be regarded as the extreme limits of normal motility. When so great a delay as three or four days is observed, an X-ray barium meal should be given. In such cases partial obstruction is often found.

Thus, by means of the carmin test, the degree of stasis or stagnation of intestinal contents may be ascertained, and the improvement resulting from diet or treatment may be observed. This test is one that ought not to be omitted in any case of obstinate constipation that does not yield readily to the measures applied, and it is advantageous in all cases; for it is a most practical and efficient method of measuring colon motility and of watching the progress of the case toward recovery.

Cases are occasionally observed in which the color disappears and then reappears. The explanation of this circumstance is the existence of a greatly dilated cecum, in which a portion of a meal may be retained while the residues of a subsequent meal pass over it and on to the exit.

Normal Frequency of Bowel Movement

Although convinced by careful and extended observations, in dealing with many thousands of normal individuals and invalids, that the bowels should be made to move several times a day, the writer some years ago set about collecting from original sources facts concerning the habits of the primates and the uncivilized tribes of human beings, for additional information as to the normal frequency of bowel movement.

In response to these inquiries, the keepers of the London Zoo, of the Bronx Zoölogical Gardens, of the National Zoölogical Garden at Washington, D. C., and of other animal collections, stated that the chimpanzee, orang-utan and the other large apes, move their bowels three to six times daily.

Extensive inquiries were made by means of questionnaires sent out to physicians, chiefly medical missionaries, practising among primitive people in various parts of the world. Replies were received from one hundred and forty of these physicians who had had abundant opportunity to become acquainted with the habits and usages of the wild or half-civilized people with whom they had been closely associated. From this original and authentic information the fact appears that, among tribes that have been uninfluenced by civilization, and still adhere to primitive habits in diet and that live a

free and active life in the wild, the bowels move two or three times daily. A single daily movement is regarded by such people as constipation, and gives rise to alarm.

A missionary physician writing from South Africa related the following incident as an illustration of the care that the natives take to secure free movement of the bowels.

Said the doctor, "A native called on me yesterday morning and asked for medicine to relieve a dreadful constipation.

"I said to him, 'When did your bowels move last?'

"He replied, 'This morning, Doctor.'

"'But I understood you to say you were constipated.'

"'Yes,' replied the native, 'I am horribly constipated. My bowels move only once a day.'

In the following countries physicians reported the usual custom to be two or more daily evacuations, usually two—for the very good reason that two meals only are eaten, the first movement being either on rising or after the first meal, and the second soon after the second meal, or before retiring:

Rhodesia, South Africa; Uganda and Nyasaland Protectorates, East Africa; Nigeria, Hardoi, Delhi, Punjab, Nagpur and Burdwan, India; Kashmir; Persia (three or four times in summer when fruits are plentiful); Aintab and Kharput, Turkey; West Coast of Africa (two

or three); Portuguese Congo (two or three); Egypt (children, four or five); Japan; Arabia (two or three).

In all these countries, as among practically all primitive people, great attention is given to the bowels. The mothers carefully train their children to move their bowels at regular times, and much pains are taken to make the diet such as to promote intestinal activity. The virtues of fruits and green vegetables are fully appreciated, and where rice is the principal food, as in most of the Orient, large use is made of green vegetables.

The late Doctor Sheppard, who practised surgery for thirty years among the natives of Turkey, informed the writer that three bowel movements a day is the universal habit of the peasant people of that country. If the bowels fail to move three times a day, a physician is promptly consulted.

Sir Arbuthnot Lane also informed the writer that a member of the Turkish Embassy at London once called upon him for relief of constipation because his bowels moved but twice a day when they should move three times. He stated that when his bowels did not move three times a day he felt much depressed and that his physical vigor was greatly depreciated.

It is interesting to note that the experience of the millions of primitive and half-civilized people who inhabit the above-named countries

demonstrates perfectly that an intake of food should be followed by an output of food residues and other wastes.

The average civilized man, if he is so fortunate as to have his bowels move once a day, or even once in two days, feels that his condition is very satisfactory. But since the chief business of the colon is to eject wastes from the body, why should the performance of its function be so long delayed? These wastes are made up not only of bacteria and excretory products—the undigestible elements of the food constituting only about one-half its bulk, while starch, fat and protein are found in only very small and negligible quantities—but also of bile, and other highly poisonous excretions that are discharged into the colon from the blood. No possible good but only much harm can come, then, from the prolonged retention of these body wastes and unusable residues. There is, in fact, no physiologic reason why food residues should be retained in the body more than twelve to eighteen hours, or at longest twenty-four. It is evident, then, that bowel movements should occur at frequent intervals, at least after each meal, for the purpose of removing these waste and poisonous materials.

Regularity

Most people regard regularity as the essential element of colon health, and almost ignore

the matter of frequency and thoroughness of evacuation. The late Sir Lauder Brunton, the eminent English internist, told of a lady who in response to his inquiry about the colon function answered, "Perfectly regular, Sir, perfectly regular." When further questioned, she disclosed the fact that although her bowel movements were "perfectly regular," they occurred only once in three weeks.

Two factors are chiefly active in producing bowel movements at regular intervals in normal individuals. The first is the practice of taking food only at stated intervals, at regular meal hours. Since bowel movement depends so largely upon the stimulus derived from eating, it is evident that regularity of bowel movement depends upon regularity of eating. When the meals are not taken regularly, the rhythmic peristaltic impulse by which the feces are pushed forward from the colon into the rectum is lacking. If, for example, a person's habit is to move the bowels immediately after breakfast and the breakfast is not taken, the bowels may not move. Or, if a movement takes place, instead of complete emptying of the greater part of the colon, as occurs in a normal movement, only the pelvic loop will be emptied and fecal matters will remain in other sections of the colon.

Big apes move their bowels three times a day, but small monkeys move theirs ten or twelve times a day. The reason was found to be be-

cause the large apes were fed regularly three times a day, while the small monkeys were fed continuously by visitors, who were permitted to give them nuts, bread, fruit, etc., so that they were eating practically all of the time.

It is a matter of common observation that when animals are fed, defecation occurs shortly after. In the case of animals with short alimentary canals and short colons, like the barnyard fowl and many birds and most fishes, defecation is very frequent because eating is almost continuous. In man, the colon is sufficiently capacious to allow of the accumulation of residues to a moderate degree, so that the evacuation of wastes may occur at intervals and not so frequently as to be a serious inconvenience.

Regularity of bowel movements is, therefore, chiefly dependent upon the character of the food and the number and regularity of meals. In general, an intake of food should be followed within an hour or less by an evacuation of the residues of a preceding meal.

The second factor influencing regularity of the bowel movements is regularity in the hours of sleep and morning rising.

The important relation of sleep to constipation is shown by the fact that loss of sleep, or a change of sleeping hours from night to day, very quickly upsets the bowel rhythm in persons of sedentary habits.

Cannon showed that the bowel contents ad-

vance very slowly during sleep, but very rapidly during and directly after eating.

It is known, also, that sleep slows the movements of the stomach and intestine by lessening the activity of the diaphragm and abdominal muscles. Evidently sleeping after eating must tend to constipation by interfering with the normal advance of the colon contents toward the exit.

Loss of needed sleep does not, however, increase bowel activity. It decreases it, doubtless because of its generally depressing effects. This is shown in the resulting lack of appetite and in the coating of the tongue. Relish for food is one of the normal stimuli of the intestines.

The increased nerve tension noted in persons who have been deprived of sleep, and especially in persons who suffer from inability to sleep, is manifested in many definite ways, one of which is a contracted or spastic condition of the descending colon. The colon is often so firmly contracted as to be closed up completely. It may be felt low down in the left side of the abdomen and rolled under the finger, and give an impression resembling that of a piece of firm rubber tubing.

The resumption of bodily activity on rising in the morning is one of the important means by which the bowels are made to act with regularity, by stimulating the colon to empty a portion of its contents into the rectum.

When the hours of sleep are irregular, and especially when insufficient time is devoted to sleep, this physiological stimulus is lacking, and constipation may be one of the evil consequences resulting.

Even when the bowels do not move soon after rising, the stimulus of rising after a good night's rest at least aids in the filling of the pelvic loop, which then only requires the stimulus of breakfast to cause a normal bowel action.

With the savage, regularity of bowel movement is seldom a matter of consideration, for the reason that he is rarely so situated that he cannot respond quickly to the "call" for evacuation. But civilized human beings, by their systematic and in general their closely occupied lives, often find themselves in circumstances that compel a considerable delay in answering the "call." Rather than interrupt the normal rhythm, even on a single occasion, it would be better to incur a very considerable degree of inconvenience, a fact that the constipated person must take to heart and carry in mind. But it is better to observe such an order of life and such regularity of habits as will cause the bowels to move at a time at which they may, without haste or inconvenience, receive the leisurely and thorough attention that the importance of this function demands.

If a full meal cannot be taken, some fresh fruit, as an apple or two or a couple of oranges,

may serve the purpose of maintaining the normal rhythm. When strong stimulation is needed, psyllium seed or a bran biscuit may be added with advantage, with a dose of mineral oil.

Importance of Avoiding Haste

Normally, the act of defecation occupies but a few seconds. The colon acts with so much celerity that when watched under the penetrating X-rays its movements can scarcely be followed by the eye. There is a vigorous surging that passes in waves from one end of the colon to the other within a few seconds, and then the colon is at rest, but it is easily seen that the contents have been moved forward.

The colon is not completely filled with fecal matter except in cases in which the bowels move but once a day or less frequently, so that there is an accumulation of food residues that not only completely fill but distend the gut.

Under normal conditions, the lower bowel or pelvic colon acts as a reservoir for the food residues that are ready for dismissal, and when this part of the intestine is filled and begins to overflow into the rectum, a reflex is set up that empties this reservoir.

After a normal movement the colon is empty, from the splenic flexure down, and there may be seen to have been a forward movement of feces in other parts of the colon.

It sometimes happens that the whole left half

of the colon is emptied by the same contraction that discharges the contents of the pelvic colon, but not infrequently the first evacuation empties only the pelvic colon, while at the same time starting a movement of material along the descending colon that a few minutes later reaches and again fills the pelvic colon and so leads to a second evacuation.

There are, however, so many persons who are not quite normal, even though apparently healthy, that perfectly natural bowel movements are probably the exception rather than the rule among civilized adults.

The pelvic loop of the colon has in most people been so much abused by wrong diet and by resisting the "call," thus compelling an accumulation there, it is often so greatly dilated or so much folded upon itself that two or even three efforts are necessary for its complete evacuation. It often happens, therefore, that after the first portion of feces has been expelled, a second or even a third installment is brought down and a second or third action of the colon occurs.

The first partial movement empties the rectum and the lower part of the distended pelvic colon. By waiting and by repeated effort, aided perhaps by pressure with the hands upon the lower abdomen on the left side, an additional portion of feces may be forced down into the rectum. This excites the center of defecation,

just as touching the back of the throat excites the vomiting center. It causes the colon to contract, the anus to open, and results in a second bowel movement. In like manner, a third or even a fourth installment may sometimes be discharged.

But this requires time, perhaps five, ten or even fifteen minutes, so that a hurried visit to the toilet does not give the colon an opportunity for thorough evacuation. Great haste may even cause spastic contraction and prevent evacuation altogether.

The bustling or worried business man, the hurried clerk, the student who has barely time to reach his school before roll call, the housekeeper who is perhaps superintending some important culinary operation, these and a thousand other busy individuals often err in thinking that they have no time to devote to a function looked upon as grossly animal and repulsive.

Undue haste in bowel movement is often encouraged by unsuitable toilet arrangements. In many places, especially in country districts, the insufferable "privy" still exists, and is a most prolific source of misery. The use of such a place for evacuation of the bowels is at all times more or less inconvenient and offensive, and on this account is avoided as much as possible, leading to neglect of the "call," or, when necessity compels the use of the offensive place, to a visit made as brief as possible.

In cold weather, the danger of injury from exposure of the unprotected body to a low temperature, sometimes even zero weather, is very great, especially in the case of feeble or delicate persons. Extreme cold also tends to prevent effective defecation, by contracting the anal muscles so strongly as to negative the effect of the automatic reflex by which the outlet is normally opened.

The toilet should be conveniently placed, and should be made as warm and comfortable as a bathroom. It should be kept in such a neat and sanitary condition as to be in no way offensive.

Ignorance of the consequences does not prevent the evil effects that certainly follow neglect. The residues left behind in the half-emptied pelvic colon become so dry and hard before another opportunity for evacuation occurs that the difficulty is greater than before, and so a considerable quantity, often an increasing amount, of material is held back, and cumulative constipation is established.

The time should be sufficient for complete emptying of the descending and pelvic colon. All fullness and weight in this region, as well as the sense of fullness in the rectum, which commonly prompts to bowel movement, should disappear after defecation. If necessary to occupy the mind by glancing over a morning paper, this will do no harm provided it is not allowed to interfere with the muscular efforts that

may be necessary to force down into the rectum from the pelvic colon a sufficient amount of residues to induce an expulsive action of the bowels.

Many persons evacuate their bowels in the morning by two movements, one ~~on~~ rising and the other soon after breakfast. Whatever may be the vagaries of the individual colon, if it can be persuaded to act at all, other things must be accommodated to its need.

A crippled colon must be humored and coddled, so to speak. In many cases apparently hopeless, the colon may be trained back to habits of normal activity and regularity. It must not be expected, however, that this will be accomplished in a day or a few days. Many months of patient effort may be required. When there is definite evidence that the colon is incapable of emptying itself completely, an enema should be taken at bedtime.

DANGEROUS ERRORS ABOUT THE COLON

There are several very prevalent errors respecting the colon and its functions that are probably responsible for most of the miseries that arise from disorders of this part of the body.

One of the most mischievous and dangerous errors is the idea that the colon function can be neglected or postponed with impunity. Many people, perhaps the majority of them, regard the moving of the bowels as a disagreeable duty that may be regulated to suit the demands of business or convenience. The results are most disastrous. A multitude of human ills are the result of this neglect.

The "Well-Formed Stool" Evidence of Constipation

Another common error, and one held by most medical men as well as the laity, is that the stool should be "formed." This is a false notion that has grown out of the universal constipation that prevails among civilized folk. The vegetarian Hindus of Armistar, who live chiefly on ground wheat and vegetables, have "large, bulky and not formed but pultaceous" stools, according to Dr. A. H. Browne.

A well-formed stool always means constipation. The significance is that the colon is packed full like a sausage and that the fecal matters have so long been retained that they have been compacted by the absorption of water. The whole colon is filled, and the bowel movement is the result of the pressure of the incoming food residues at the other end.

As explained elsewhere, the bowels should move after each meal. When the wastes are evacuated with normal celerity—that is, within less than twenty-four hours from the time the food is eaten—the stools have a soft, mushy consistency. The well-formed stool is produced by delay of the food residues in the descending and pelvic colon for so long a time that an excessive amount of water is absorbed from them.

When the body wastes are discharged promptly, as they should be, the colon never contains the residues of more than two meals. At the after-breakfast movement, the colon should be completely emptied, so that the disinfecting and lubricating mucus that its walls secrete may have the opportunity to cleanse and disinfect the body's garbage receptacle and thus to keep it in a sanitary condition.

One-a-Day Constipation

That one bowel movement a day is normal and efficient evacuation of the bowels is another error that is universally entertained. One bowel

movement a day is a positive indication of constipation.

Hurst showed by X-ray examinations that in persons whose bowels move only once a day the average time required for emptying the colon after a barium meal is about fifty-three hours. Observations made by Case and his assistants in many thousands of cases confirm the statement of Hurst. X-ray examinations frequently show retention of residues for four or five days or even more.

Some thousands of observations made in the Battle Creek Sanitarium clinic by the aid of the carmin test agree with the X-ray findings. Carmin administered with the breakfast usually appears within twenty-four hours, but, in cases in which the bowels move once a day, rarely makes its last appearance, which is of chief significance, in less than forty-eight hours or even longer. Seventy-two hours or three days is not an uncommon observation, and the writer has observed cases in which the color did not disappear until the end of four days and, in one case, six days.

During this time the residues accumulate until the colon contains the remains of at least five or six meals, instead of only two, as is the case when the normal rhythm of an evacuation after each meal is regularly maintained.

It is thus apparent that the average person whose bowels move but once a day is really

constipated, for he does not empty the whole colon but only the lower part of it, and consequently it is most of the time completely filled or distended. In time it becomes permanently enlarged and seriously handicapped. Pouches and diverticula are formed, various distortions occur, and finally the colon becomes so crippled that it ceases to perform its function as a waste-disposal organ and becomes a cesspool of festering germs and a most prolific incubator of disease.

The person thus suffering from chronic constipation is constantly menaced by a multitude of troubles and disorders ready to develop at almost any moment, for an interruption of the one-a-day movement, as the result of the loss of a night's sleep or the omission of a meal, will at once give rise to a multitude of unpleasant symptoms, such as headache, malaise, "biliousness," loss of appetite and other miseries.

The retention of food residues for more than twenty-four hours, therefore, while almost universal among civilized people, is notwithstanding abnormal. Retention of material such as protein in the colon for so long a time necessarily results in putrefaction, even though the protein ration be comparatively low, since there will be found in the food residues a sufficient amount of unabsorbed protein to furnish a favorable nutrient medium for the growth of putrefactive organisms, whose rôle in the de-

velopment of many maladies will be later explained.

When the residues are so long retained, the carbohydrates necessary for supporting an aciduric flora, which is antagonistic to the development of putrefactive organisms, are so completely absorbed that the protective flora cannot develop, and thus an opportunity is afforded for the growth of *B. proteus*, *C. Welchii* and other putrefactive organisms.

Some years ago a leading English physician recommended constipation as a measure of food economy. It was the contention of this physician that if the bowels were moved only once in two or three days, the absorption of food would be more complete and less food would be needed. Some years later Mr. Horace Fletcher gave wide publicity to this idea, in connection with his chewing campaign. Mr. Fletcher insisted that the food must be chewed until liquefied, before swallowing, and that all fibrous or insoluble material should be rejected and returned to the plate. Very pronounced constipation was the natural result of this practice. Small and infrequent stools were recognized as one of the expected results. Mr. Fletcher himself considered his personal practice of moving the bowels once or twice a week, the stool hard and scanty, as one of the proofs of the advantage of his theory. Hundreds of persons whom he convinced of the advantages of such rejection of

roughage gave it a trial, but were compelled to give it up, as did Professor William James, because of the bad effects of the constipation that resulted and that was wrongly charged to mastication, although really due to the rejection of cellulose that is necessary to furnish bulk for the stimulation of the intestine.

While it is doubtless true that less food is usually consumed by persons who are constipated, this fact is not the result of increased food economy but of lack of appetite. The toxemia that lessens the appetite lessens also initiative, endurance and efficiency, and cannot be considered in any way an advantage.

From the simple one-a-day constipation, the functional disturbance of the colon progresses to more serious forms of functional constipation, and in a multitude of cases to permanent damage of the colon as the result of infection and overdistention with accumulated fecal matters and the gases resulting from fermentative and putrefactive changes therein. Colitis and pericolitis, with crippling adhesions, diverticulitis, appendicitis, and even cancer, are natural consequences of this habitual neglect.

Significance of Offensive Residues

Still another error that leads to wrong conclusions and paralyzes efforts toward change of conditions is the supposition that the stools or fecal matters are necessarily putrescent and

loathsome. This is by no means true. The writer has had under his care at different times a number of patients who had temporary openings close to the lower end of the small intestine where it joins the colon. Examination of the intestinal contents when they had an opportunity to escape at this point showed that they were often wholly free from offensive odors and other evidences of decomposition. It is the changes that take place in the colon, therefore, that are the cause of the offensive character of the stools.

Such changes are the natural and necessary result of the long delay of putrescible material in the warm, moist colon, always swarming with germs—the most favorable place imaginable for the promotion of putrefactive processes. Let the reader try to imagine what would happen to a beefsteak carried in an inside pocket next to the warm skin for two or three days. It would certainly become far advanced in decay. That is just what happens to every particle of undigested meat and other proteins unduly delayed in the colon. The change known as putrefaction is slow in beginning; it makes little advancement for the first twenty-four hours, but after that the intensity of the process increases very rapidly.

The carmin capsule test shows that in most cases of one-a-day bowel movement, the waste disposal function is several days in arrears; the colon contains the waste and residues of several

meals, anywhere from five to twenty or even more, so that there is ample opportunity for the putrefactive process to get well under way. This putrefaction is the source of the foul odor and gases that originate in the colon and that are not only most offensive to the sense of smell, but, as is well known, are also highly poisonous, and may give rise to nausea, "biliousness," loss of appetite, foul tongue, bad breath, dingy skin, headache, Bright's disease, and a host of other grave disorders.

Injurious Effects of Drug Laxatives

Still another grave error that has come to be almost universal is the trust reposed in saline mineral waters and other laxatives, as means of combating colonic stasis or constipation.

One of the best evidences of the universal prevalence of constipation is afforded by the enormous use of laxative and purgative drugs. The columns of the newspapers are filled with advertisements of drugs that act upon the bowels. The quantity of this class of drugs used annually far exceeds that of any other.

By the term *drugs* is meant substances that produce laxative effects through their chemical properties. All such drugs are harmful, and produce not only colitis and worse constipation, but injury to the stomach and particularly to the duodenum or second stomach, the chief seat of digestive disturbances.

It has been learned in recent years that such symptoms as loss of appetite, hyperacidity, heartburn, flatulence, nausea, "biliousness," epigastric pain, and the miscellaneous miseries commonly grouped under the terms "nervous dyspepsia" and "vagotonia" are most often due to chronic disease of the duodenum. Treatment for this condition is ineffective so long as drug laxatives of any sort are used.

Besides drugs proper, there is sold a prodigious quantity of laxative mineral waters. It would be difficult in the average community to find a household in which there is not kept on hand a supply of some favorite laxative. Many housekeepers lay in supplies of bowel medicines as regularly as they do their stock of groceries and other necessities—and medical advice is sought no more in relation to the one than to the other.

Constipation is not a disease; it is only a symptom. The morbid condition upon which the symptom depends may be any one of a score or more of things, or several of them in combination. Some cases of constipation are purely functional in character, others are organic or structural affections. Not one of these disorders can possibly be more than temporarily relieved by laxative drugs. The use of laxatives as a routine measure, a practice that is almost universally in vogue with the medical profession as well as with the laity, is therefore illogical.

All laxative drugs are irritant poisons. They act in different ways, and some are more harmful than others. Among the most largely used laxative drugs are aloes, senna, rhubarb and cascara. All of these drugs contain irritant poisons derived from anthracene.

When a preparation of aloes is employed for a length of time, there occurs, in consequence of the persistent congestion of the descending colon and rectum, dilatation of the hemorrhoidal veins, according to Levin. Fallopius said that out of a hundred persons who make habitual use of aloes, ninety are attacked by hemorrhoids. Sollman said that when injected hypodermically, aloin causes a tubular nephritis, acute Bright's disease. The extensive use of this irritating drug in various popular laxatives and much advertised nostrums may well be one of the active causes of the alarming increase in disease of the kidneys that has occurred within the last half century.

Rhubarb, according to Sollman, contains a poison that produces a secondary constipation.

Calomel, a drug that since the time of Paracelsus has been extensively used as a laxative and also in conditions resulting from constipation, one of the most common of which is popularly known as "biliousness," may afford prompt temporary relief; but when its use is often repeated, it becomes a highly dangerous and injurious agent.

All metallic drugs are combated by the liver, which absorbs as much as possible of the poisons into its own tissues as a means of protecting the rest of the body. Thus the liver is particularly subject to injury. Bennett of Edinburgh showed more than a hundred years ago that calomel does not increase the action of the liver, and his observations have been in recent years confirmed by Rutherford and others.

Phenolphthalein and other of the more modern types of laxatives are perhaps less drastic in their effects, but the claim made for each of these new drugs that it is harmless, that "at last the innocuous laxative has been discovered," is never made good. There is no such thing as a harmless drug laxative.

Salt water taken on an empty stomach has in recent years been highly recommended as a means of keeping the colon free from putrefying residues. A quart of salt water taken on rising will usually secure a thorough movement of the bowels, but it is a mistake to suppose that this remedy is innocuous. The theory of those who recommend it has been that, because of its rapid elimination, little salt is absorbed so that the effect is chiefly mechanical, a sort of drenching of the alimentary tract from end to end.

Careful experiments conducted in the research laboratories of the Battle Creek Sanitarium have shown that a large part of the salt is absorbed and eliminated through the kidneys.

This excessive intake of salt, repeated habitually during many months or years, must produce a harmful effect upon the kidneys. Salt is by no means a neutral or harmless substance. In China a popular method of suicide is swallowing a pint of a saturated solution of salt.

Furthermore, the effect of a salt solution is essentially the same as that of ordinary mineral waters. As pointed out years ago by Professor von Noorden, the eminent German internist, mineral waters and saline laxatives of all sorts, when habitually used, give rise to colitis. X-ray examinations show that after a dose of saline water the descending colon is left in a spastic condition, evidently the result of the congestion and irritation provoked by the salt water.

While the temporary use of medicinal laxatives is sometimes necessary, and always justifiable when required as an emergency means, there can be no doubt that the continued use of laxative drugs of any sort is highly injurious to the intestines, and in many cases to other organs.

Not the least of the damage done by laxatives is the injury to the stomach and the duodenum. The drug is given by the mouth to relieve a difficulty at the other end of the digestive tract, than which it would seem nothing could be more irrational. In a large number of cases of constipation, the whole trouble is a loss of the rectal reflex. The feces accumulate in the rectum or the pelvic colon because of failure of the

discharging mechanism. What could be more really absurd and irrational than to irritate and worry the stomach and the whole twenty-two feet of small intestine, besides the cecum and the greater part of the colon, just for the purpose of exciting to action the last six inches of the intestinal tube, the rectum?

Laxative drugs may impair digestion, in time, setting up gastric catarrh and producing achylia, a condition in which the stomach glands secrete no hydrochloric acid, thus leaving both the stomach and the intestine a prey to the various sorts of pernicious bacteria that are constantly finding their way into the stomach through the mouth, especially through the medium of flesh foods, milk and cheese.

Laxatives are particularly injurious to bed-ridden patients, because of the slow emptying of the stomach usual in such cases, in consequence of which the stomach is more than ordinarily damaged.

X-ray examinations, made by Case at the Battle Creek Sanitarium, in hundreds of cases have proved that laxatives of all sorts do great harm, not only by causing spasm or spasticity of the lower part of the colon, but by increasing anti-peristalsis, by which the fecal wastes are held back in the cecum and first half of the colon, which thereby becomes distended, over-stretched and permanently damaged.

One of the consequences of this overstretching of the colon is the crippling of the ileocecal valve, which is rendered incompetent so that the putrid fecal matters accumulated in the colon are forced back into the small intestine and are thus mingled with the digesting foodstuffs and absorbed into the blood along with them. This is essentially the same thing as discharging a sewer pipe onto the dinner table and mingling sewage with the food.

Most drugs that act upon the bowels produce their effect only after having been absorbed and circulated through the blood. It is thus evident that the action of laxative drugs is not confined to the intestine, but that through absorption into the blood stream these irritating substances are brought into contact with all the tissues.

The more certain their action as laxatives, the more certain will the continuous use of laxative drugs for any length of time be followed by serious injury. Said Professor Falta, an eminent German physician, "Nothing is so bad as the chronic use of laxative drugs."

The use of laxative drugs must be regarded as one of the most certain and prolific causes of constipation. A person who has once formed the habit of using laxatives must as a rule continue the practice as long as he lives, unless he is so fortunate as to find some one wise enough to show him the way out of his troubles.

DIFFERENT FORMS OF CONSTIPATION AND THEIR CAUSES

By constipation is generally understood infrequent or difficult bowel movements, an inactive state of the bowels. If the bowels move freely once a day, the average person considers himself fortunately healthy. Whereas, he may be carrying in his colon an amount of accumulated residues that would surprise him. This fact is easily made evident by an enema taken immediately after a bowel movement.

Even when the bowels move several times a day, there may be a large residual mass always remaining in the colon, the evacuation being merely the overflow from a stagnant reservoir.

This stagnation of residues is known as stasis. We may have stasis without constipation, but not constipation without stasis.

In the rational treatment of morbid conditions of the colon, stasis is the great evil to be combated. It is necessary not only for the bowels to move with normal frequency, that is, at least three times a day, but for the evacuation to be so complete that there is no undue accumulation of residues.

It is important, therefore, to recognize that the real problem is not constipation but stasis, and that intestinal stasis of the most pronounced

sort may be associated with chronic diarrhea or very frequent bowel movement. In general it may be said that constipation, or infrequent and difficult bowel movement, is associated with stasis of the left half or distal portion of the colon, whereas with stasis of the right half or proximal portion of the colon, increased frequency of bowel movement with loose stools is the rule, although there are mixed cases in which there is alternation of the two conditions. The writer remembers a case, that of a New York merchant with arteriosclerosis, who requested that no attention be paid to his colon since it was already too active, stools occurring ten or twelve times a day, but in whom an X-ray examination showed a right-sided colonic stasis of ninety-six hours.

Rational therapy of a badly crippled colon must be based upon a careful X-ray examination with a barium meal and a barium enema, by which means alone is it possible to determine with any degree of exactitude deviations from the normal in structure and function.

It is necessary to keep in mind the fact that there are several distinct types of constipation, or stasis, and combination of types, and that treatment must be adapted to individual cases.

Simple Constipation—Hard, Dry Stools

Persons often suffer because of dryness of the stools. This condition may result from the

drinking of an insufficient amount of liquid.

Sweating, if very profuse, encourages intestinal inactivity by removing large quantities of water through the skin, and thus producing excessive dryness of the intestinal contents. Athletes often suffer much from this cause.

Excessive activity of the kidneys, as in diabetes mellitus or diabetes insipidus, may produce the same result, by depriving the feces of water.

Goodhard, Schmidt and others hold that abnormal dryness of the feces may be produced by excessive digestion and absorption, leaving so little residue that the bulk of the intestinal contents is too small to stimulate peristaltic action. It is possible that cases of this sort may exist, but it seems more probable that the fault is a too concentrated diet or deficient gastric or intestinal secretion, at least in most of the cases in which this diagnosis has been made. It is much easier to see how the intestine can fail to do its work completely than to understand a condition of excessive activity of digestion.

A deficiency of fat in the diet also may lead to dryness and constipation. The presence in the feces of a certain amount of unabsorbed fat is useful, not only to prevent excessive dryness, but to prevent too great adhesiveness of the feces and thus to facilitate movement along the colon.

Rectal Constipation

Normally the rectum is empty after a bowel movement, and remains so until another evacuation occurs. The rectum is not intended for the storage of residues even for a short period, as is the colon, but is merely an ingeniously contrived mechanism for securing evacuation of residues at regular intervals. After a normal evacuation, the pelvic colon—the loop of intestine that joins the rectum—like the rectum, is completely emptied and falls down in the left side of the abdominal cavity. As the residues gradually accumulate, the pelvic loop rises. When it is full, it begins discharging its contents into the rectum. The entrance of residues into the rectum excites the “call” for evacuation. If the call is not heeded, the rectum gradually becomes filled with fecal matter. If the neglect is habitual, the rectum is constantly filled with hardened fecal matter, its sensibility is lessened and the “call” is lost.

The rectum then gradually becomes distended and overstretched to such a degree that it can no longer contract upon its contents in such a manner as to secure complete clearance. When the rectum walls are thus weakened and paralyzed, constant contact of fecal matter with the mucous membrane produces not only loss of sensibility but chronic catarrh or proctitis, and often gives rise to hemorrhoids, anal ulcer, abscesses, fistulae and other local affections.

In well-pronounced cases of rectal constipation, a considerable quantity of feces will usually be found present in the rectum, although in a certain number of cases the accumulation occurs only in the pelvic colon. The latter cases are sometimes the most difficult to relieve, because of the existence of obstruction at the pelvi-rectal valve, or adhesions of the pelvic loop to the floor of the pelvis. Sometimes the pelvic colon has become so large by overstretching that, when filled, it is heavy and cannot rise and becomes impacted in the hollow of the sacrum, folded upon itself and incapable of emptying itself. In such cases, bowel movements occur only as the result of pressure from accumulation of feces in the colon, a process that necessarily involves great distention of the colon and resulting injury to its walls and to the ileocecal valve, which is often rendered by this means wholly incompetent.

In cases of rectal constipation, the bowels are made to move by straining efforts, but the rectum is seldom emptied. A few masses of hard, dry feces, sometimes a single mass covered with mucus, may be extruded, but a thorough emptying of the bowel never occurs. In cases in which the rectum has not wholly lost its sensibility, the sense of weight and pressure often leads to many repeated efforts during the day to relieve the bowels, with the result of securing perhaps each time a small movement. This has been termed

"fragmentary constipation" by Boas, the eminent Berlin specialist.

Disease of the spinal cord may permanently destroy the defecatory center. This form of constipation is sometimes most troublesome in locomotor ataxia.

The Lost "Call"

The "call" to bowel movement is like the call of the alarm clock set to awaken one in the morning. If not responded to, it soon ceases to be heard. It is like the voice of conscience, which may be wholly stifled by continued disregard. This is only the operation of a well-known law. A continuous sensation that is ignored eventually fades out of the consciousness. The nerves that preside over reflex activities are easily exhausted by continued stimulation. Human physiology affords many examples of this principle.

So, if the "call" evoked by the pressure of feces upon the nerves of the rectum is not responded to, after the lapse of a certain time the "call" is no longer heard. In the meantime, the feces that have entered the rectum lie there, and through the absorption of water by the intestine they become each hour drier and harder, so that when the "call" comes again, as the result of more residues being forced into the rectum and further distention produced, normal evacuation may be difficult or impossible.

It is possible, also, that the fecal matters that have been carried down to the lower part of the colon may be returned. It is not probable that this occurs to any great extent, however, for new installments of residues are continually coming down from the upper part of the intestine, and accumulate, first in the pelvic, iliac and descending colon, and finally in the transverse colon, and even in the cecum and ascending colon.

Although the bowels may be permitted to move when the next "call" occurs, the colon may not be fully emptied. The colon contents by this time may have become so dry and hard that the colon cannot be emptied by an ordinary effort. Thus there is left a residue in the pelvic and descending colon that is liable to increase from day to day, or at least as often as there is failure promptly to answer the "call" to evacuate.

As the necessary result of this gradual accumulation, the pelvic loop of the colon becomes distended more and more. This fact accounts for the variation in the size of this part of the colon which is far greater than in any other part. The late Dr. Byron Robinson of Chicago found in two hundred carefully measured pelvic colons a variation in length from five to thirty-three inches. The writer has several times encountered at the operating table cases in which the pelvic colon was fully two feet in length.

This stretching may extend to other parts, affecting chiefly, of course, the movable portions of the colon. The transverse colon often becomes loaded with delayed and dried feces, which in thin persons may be felt as hard irregular masses lying in the region of the umbilicus.

The cecum is also often found greatly distended as the result of this hoarding of feces by resisting the "call." It is very probable that the fecal matters are sometimes forced back into the transverse colon and the cecum by the strong contractions of the colon in attempts at defecation.

Not a few persons are almost at once conscious of injury. A dull headache appears. There is less appetite than usual for the next meal. Sleep is less sound and refreshing. The urine has a stronger odor, and the breath is offensive. These are simply the evidences of poisoning by absorption of toxins. The absorbent process, which dries out and hardens the feces, carries with the water that is taken up and poured into the blood, quantities of poisons that it holds in solution. These poisons overwhelm the liver with unnecessary labor, tax the kidneys and disturb every bodily function.

To lose one's "call" is almost as bad as to lose a fortune; indeed such a loss has more than once led to loss of fortune, and to worse results. The writer has many times found in the rectum large

fecal masses of which the patient was wholly unconscious, although in some instances there was evidence that they had been present in the lower bowel for days or even weeks.

By resisting and ignoring the kindly hint of Nature, that the body requires an opportunity to dispose of its poisonous wastes and refuse, thousands, perhaps we should say millions, of men and women have brought upon themselves untold miseries, have shortened their lives and greatly impaired their efficiency and usefulness.

The condition of lost sensibility, a lost "call," one of the most common causes of constipation, is a condition that is sometimes very difficult to remove, although always conquerable by persevering effort, thanks to the great light thrown upon these cases by modern medical research. No victim of this condition should rest contented until this has been accomplished.

A "call" that has been lost should be most assiduously sought for until recovered, and put into efficient operation. When the colon has by careful management once become established in normal habits, the greatest care should be exercised to avoid interrupting the daily rhythm. A certain time should be set apart for evacuation and the hour observed religiously.

Do not wait for a "call," but invite it by giving the colon a chance for evacuation, and by all means avoid haste.

By forcible efforts, such as accompany bowel evacuation, sufficient fecal matter may be pushed over into the rectum to create an effective "call," when not previously felt. Hence the importance of going regularly to stool even though no "call" is experienced. By patient effort, the sluggish bowel may after a time be trained to act with normal promptness and celerity.

The prompt evacuation of the bowels in response to Nature's "call" is a vital obligation, which no person can neglect without serious injury. Ignorance of this fact is one of the chief causes of the prevalence of constipation, a condition in which the body becomes a storehouse of the most disgusting and offensive material, which saturates the tissues with its horrible effluvia and its virulent poisons and taints the very springs of life. In Mexico and most tropical climes, young children are permitted to run about the streets wholly nude, and there is no delay when a "call" for evacuation of the bowels or bladder occurs, with consequently no damage done from loss of the reflex. Among savages who live naturally, this function receives much attention. A missionary physician tells of an Arab who declined to live in Aden because the city regulations required that the bowels should be evacuated only in certain places, as in all civilized communities, rather than anywhere at any time the "call" demanded.

Anal Spasm

Anal spasm is a somewhat unusual form of rectal constipation that deserves mention. Because of excessive tension of the anal sphincter, it may not relax sufficiently to allow normal evacuation. If soft, the stool has a narrow ribbon shape, but if of firmer consistency, it is retained.

The same impulse that causes the colon and abdominal muscles to contract in defecation causes the sphincter and muscles to relax. Anything that prevents this relaxation may seriously interfere with bowel movement, and become a cause of constipation.

Anal spasm is always associated with constipation, colitis and various crippled conditions of the colon, and often disappears when these conditions are cured or ameliorated.

The cause of excessive tension should be sought and removed. Inflamed hemorrhoids, fissures, ulcers, fistulae, and even simple irritation of the mucous membrane of the anal region, may cause the anal muscles to contract so strongly that proper relaxation does not occur when an attempt to move the bowels is made, and so evacuation becomes impossible. Other causes of contraction may be worry, lack of sleep, coffee drinking, sexual excesses or mental disorder. In some cases the affection seems to be of the nature of an obsession, based wholly upon a diseased imagination. With removal of the cause, the disorder disappears.

Spastic Constipation

In this form of constipation there is mechanical hindrance to the movement of residues along the colon, due to prolonged or spastic contraction of the muscular walls of the gut, a condition similar to that known as cramp in a voluntary muscle. The appearance of the colon, when this condition exists, is shown in the accompanying illustration.

When the colon is in this state, the residues are so long retained that they may become hard masses, which one by one are forced through the contracted bowel. These masses finally reach the rectum and are discharged, forming what is known as the lumpy stool, which is always evidence of the existence of a spastic state of the colon.

In cases of reflex spasm and in colitis, the spastic intestine may be felt under the fingers, to which it gives the sensation of a rubber tube. When the contraction is due to colitis, the intestine is also tender to pressure, sometimes extremely so. In such cases there are often present various reflex pains, such as headache, backache, or pains in the legs, symptoms that in women suggest ovarian inflammation or some other pelvic disease, which may be present but often is not.

The contracted condition is most often found on the left side, at the site of the iliac colon, sometimes extending upward, but occasion-



A Spastic Colon. Darkest Portion Shows Dila-
tation of Right Colon—Arrows Indicate
Spastic Condition of Descending Colon

ally felt in the pelvic colon also. The cecum and the ascending colon are not infrequently affected, and more rarely the transverse colon, which may be felt as a hard thick cord passing across the abdomen just above or below the umbilicus.

The spastic contractions may not be permanent. They may come and go, sometimes disappearing while under the examining finger. But they cause when present great delay in the progress of the feces along the bowel, and thus lead to excessive dryness and constipation.

Organic or permanent narrowing of the colon is a much more serious condition than simple spastic contraction and is usually incurable except by surgery. It may be the result of peritonitis or of colitis followed by pericolitis and adhesions or diverticulitis.

Cases of this sort usually present very active symptoms of intestinal toxemia. Such persons are often victims of attacks of violent headache. They show much indican in the urine, are liable to have high blood pressure, and sooner or later develop chronic Bright's disease.

As regards the causes of spastic constipation, the most usual cause is an irritated state of the descending colon resulting from the long retention of putrefying residues and the development of irritating toxic substances.

In persons who are chronically constipated, the descending colon is often constantly filled.

The long contact of the poisonous fecal matters with the mucous membrane gives rise to infection. This is colitis. It causes contraction of the bowel, thus becoming a new and most potent cause of constipation. The contraction caused by colitis not only obstructs the bowel, but also sets up anti-peristaltic movements, thus reversing the action of the bowel and carrying material back to the ascending colon and cecum. Normally the anti-peristaltic contractions start at the middle of the transverse colon and do not involve the lower half of the colon, but when colitis and spasm are present, the reverse movement may extend even to the pelvic colon. Unless mechanical means are used to cleanse the intestine, it is never clear, but always more or less completely filled with putrefying residues and masses of decomposing mucus. Dilatation of the cecum is always accompanied by colitis and a spastic condition of the descending colon. This condition is not always conspicuous, but it is an active factor in maintaining a spastic state of the colon so long as the intestinal flora remains predominantly putrefactive.

Painful affections of the abdominal organs, such as chronic appendicitis, colitis, adhesions following an abdominal operation, pelvic or bladder disease, may cause constipation not only by producing reflex spasm of the colon but by restraining the patient from making the necessary effort to expel the colon contents.

Such efforts naturally increase the pain, and so are dreaded and avoided.

The colon is abundantly supplied with sympathetic nerves and is to a remarkable degree influenced by changing states of the general nervous system. Even mental states are reflected in the colon, especially the descending part. Fear, anger and other depressing emotions quickly give rise to a spastic state of the descending colon. The loss of a night's sleep, worry, anything that produces a state of high nervous tension, may cause a spastic state of the colon and thereby prevent normal bowel action.

The So-Called Atonic Colon

The so-called atonic colon is rare in the writer's experience. Frequently, in the course of an abdominal operation, he has seen a colon supposed to be highly atonic become decidedly spastic within the short time occupied by the operation.

The so-called atonic colon is a colon that is rendered inactive by the inhibitory influence of alkaline contents. Such colons can usually be made to function by means of an enema containing citric or lactic acid, a dram to the pint. The addition of the juice of one or two lemons or a tablespoonful of lacto-dextrin to a hot-water enema will rarely fail to secure complete evacuation.

A significant feature of these cases is the fact

that not infrequently one part of the same colon, usually the left half, may be highly spastic while another portion, the proximal half, is supposed to be in a highly atonic state. When the ammoniacal and highly toxic contents of such a colon are displaced by acid contents, both atonic and spastic conditions soon disappear and the colon begins to behave in a normal and efficient manner.

Masked or Latent Constipation—Stasis

Constipation is defined by the dictionary as a condition in which "the evacuations are obstructed or stopped and the feces are hard and expelled with difficulty." A medical dictionary defines constipation as "infrequent or difficult evacuation of the feces." These definitions express the idea respecting the condition commonly known as constipation generally held by both the profession and the laity. Unfortunately, the word *constipation*, as thus defined, does not properly represent the fundamental condition of which the so-called constipation is a symptom only, and which is the source of the toxemia, colitis and numerous other morbid conditions associated with constipation. This fundamental condition is stagnation, or prolonged retention of the food residues and body wastes in the colon. This condition is technically known as *stasis*, a word derived from the Greek, meaning stoppage.

But stasis in the colon is not necessarily associated with either infrequent or difficult bowel movements. Stools may be abnormally frequent and "loose" when very marked stasis is present. Frequent, loose stools are, in fact, present in a great many cases of autointoxication or intestinal toxemia because of long retention and consequent putrefaction of the colon contents. It is apparent, then, that the word *constipation* does not really describe the condition with which we are dealing, since we may have stasis with frequent as well as with infrequent evacuations. There may be three or four or twice as many evacuations daily without the colon being at any time thoroughly emptied. While the number of bowel movements is sufficient, the elimination of wastes is a day or several days in arrears. This is, in fact, the condition found present in most cases of chronic diarrhea. X-ray examinations made in these cases frequently demonstrate the retention of fecal matters for three to five days, and even longer.

As a matter of fact, in the very worst cases of stasis, those in which the symptoms of autointoxication are most pronounced, six or even more bowel movements may occur daily. What matters is not only that the bowels shall move frequently, but that the colon, at least the lower two-thirds of it, shall be completely emptied at each movement and that no long delay shall occur in any part.

It thus happens that many persons who think they are not constipated because their bowels move daily, and who are not constipated in the sense in which the term is ordinarily used, may nevertheless be suffering from masked constipation or stasis, although quite unaware of the fact. The bowels are regular, moving daily, or perhaps several times a day, and yet these persons are toxic. The tongue is coated, the breath foul, the complexion muddy. Headaches are frequent and often nearly constant. Also there is a lack of "pep," a constant sense of fatigue, and often a craving for drugs such as tea and coffee, tobacco or alcohol in some form.

A large amount of intestinal gas, even when accompanied by normally regular and frequent bowel movements, is a common symptom in masked constipation; it is practically always an indication of retained food residues. By a careful analysis of symptoms and an X-ray examination, always necessary in such cases, the nature of the hindrance to normal evacuation will be discovered and the proper measures may be applied. It may be shown by suitable tests that decomposing food residues and body wastes are retained in the upper portions of the colon for two or three days, or even longer.

In such cases, the cecum is dilated or crippled, and has become a cesspool that ever overflows but is never emptied without the use

of cathartics or an enema, and even these are not always immediately successful.

A marked symptom of latent constipation, when associated with incompetency of the ileocecal valve, is the great amount of intestinal gas from which it is impossible to get entire relief. This is due to the fact that the gas generated in the colon escapes back into the small intestine and cannot be wholly expelled because the colon discharges its contents in both directions.

Cecal or Right-Sided Constipation

The cecum is a shallow pocket intended to hold a small amount of liquid for a short time. If the bowels are restrained from normal action, the cecum becomes filled by the backing up of semi-solid feces, which cause it to sag down.

Normally, at frequent intervals the cecum contracts upon its contents, lifting the residues up through the ascending colon and over into the transverse colon. When the cecum is dilated, its ability to push its contents along is greatly lessened, and when it is adherent, this highly important function is lost altogether.

The dilated and adherent colon is thus a stagnant cesspool in which food residues and body wastes accumulate and putrefy, being retained in many cases for days and even weeks, generating indol, skatol and other poisons, as well as poisonous gases that distend the bowel. Even if the bowels move regularly, the dis-

charged materials should have been gotten rid of twenty-four or forty-eight hours before; there is a latent or masked constipation, the evil results of which do not materially differ in the main from those of other forms of constipation, although likely to escape attention.

Cecal or right-sided or latent constipation differs from every other form in the fact that the stools are semi-fluid and frequent. This leads the patient to think he is suffering from excessive activity of the bowels. The stools are not only loose and frequent, but they are always foul smelling and usually they contain more or less mucus.

That the condition is one of delay rather than of increased activity may easily be shown by a carmin test. When carmin is administered in cases of actual excessive intestinal activity, the red color appears in the stools within a few hours and disappears with very little delay; whereas in these cases of cecal or right-sided constipation, the carmin usually makes its appearance only after a day or two, and may not disappear for several days unless enemas are administered.

The patient's history, in this type of constipation, often refers to one or more attacks of so-called chronic appendicitis. Not infrequently the appendix has been removed, while the local pain and tenderness in the right side remain. The patient often mentions having ex-

perienced a very pronounced sense of weight and heaviness in the right side, and having noted splashing and gurgling sounds. Achylia (lack of hydrochloric acid in the gastric juice) is frequently present. There are generally signs of pronounced toxemia; the tongue is coated, the breath bad, the teeth decayed, the skin sallow, the urine concentrated, loaded with toxins and often showing casts. Not infrequently the liver is found enlarged, and tests for renal efficiency show that the kidneys are damaged.

An Italian physician has applied the term right-sided constipation to this form of colon trouble because of the marked changes found in the cecum. But, in fact, the disease is not confined to the right side. The whole colon is affected.

In these cases, as in most other forms of constipation, the trouble begins with the left side of the colon, where delay of the residues first occurs. Delay gives rise to colitis and a spastic state of the descending colon, causing mechanical obstruction and the accumulation of residues in the cecum with overdistention, infection, the formation of adhesions and various other morbid conditions. As the result of long-continued inflammation, the absorbents, which usually carry off the surplus water, become blocked, so that the stools remain fluid. Putrefaction is thus encouraged, and a profound intestinal toxemia develops.

Because of incompetency of the ileocecal valve, the small intestine has no protection. The reverse peristaltic activity that takes place in the colon soon after each meal forces putrescible material back into the small intestine where absorption is rapid, and thus intense toxemia is induced. This may be one cause of the dullness and ineptitude experienced by many of these patients after eating, sometimes so great as to cause complete incapacity.

Cecal constipation, although commonly classed as chronic diarrhea, is, in fact, the most serious of all forms of constipation. It is, however, only the advanced stage of simple or rectal constipation. The infection gradually extends upward, sometimes reaching the duodenum and even the stomach.

Adhesions

Post-mortem examinations show evidences—as reported by Professor Virchow more than half a century ago—of disease of the intestines in almost every case of many hundreds examined, irrespective of the cause of death. Indeed, he declared it to be almost impossible to find an adult person whose intestines did not show adhesions and other evidences of chronic disease.

At that time the origin and significance of these inflammatory conditions was not understood. We now know that infections of the intestinal mucous membrane, by causing inflam-

mation of the intestinal walls, readily extend to the outside, giving rise to inflammatory changes and adhesions. In these adhesions, located in various parts of the intestine, but particularly at special points as noted by Professor Virchow, we have both a cause and a consequence of constipation.

The most common and crippling adhesions are those connected with the pelvic colon and the cecum. The pelvic colon when empty collapses and sinks to the lowest part of the abdominal cavity. The prolapsed bowel may become adherent wherever it happens to fall and then may fail to rise. A pelvic colon thus crippled no longer acts in an efficient manner to discharge the food residues. As a result, the fecal matters accumulate in the descending colon until the pressure becomes so great that they are forced through to the rectum.

In such cases, the stools are dry, hard, lumpy masses, usually covered with mucus, and are expelled with difficulty, generally only by the aid of a drug laxative or an enema. Colitis is always present as the natural result of the chronic stasis. It is the extension of the infection through the wall of the intestine to its peritoneal covering that gives rise to the adhesion.

In many cases, probably the great majority, there is prolapse without adhesions. Prolapse is the normal position of the pelvic colon when empty. It sometimes becomes lodged in its

prolapsed position either permanently or temporarily without being adherent. When the failure to rise is temporary, the obstinate constipation is intermittent.

Adhesions of the cecum may be the result of colitis or due to appendicitis. They are very liable to be present when operations have been performed for the relief of appendicitis. Adhesions of the cecum prevent its normal action, which is to lift up and push into the transverse colon the food residues that enter the colon from the small intestine. When the cecum can no longer perform this function, it becomes a sort of cesspool in which fecal matters accumulate and often reach an advanced stage of putrefaction. The adherent cecum often becomes dilated to an enormous extent, filling the pelvis and compressing the rectum.

Mixed Cases

In most cases of chronic constipation, both the right and left sides of the colon are affected. The disease, beginning in the rectum, has gradually extended to the whole colon. Colitis in some degree is practically always present. The rectum is insensitive, the pelvic or descending colon spastic and the cecum dilated. In many cases there are adhesions of the cecum as well as a prolapsed and often adherent condition of the pelvic colon.

These mixed cases are often named in accordance with the dominant symptoms present. If the stools are dry and the rectum much dilated and insensitive, the case is called *rectal constipation*. If the colon is highly spastic and the intestine sensitive and painful, *spastic constipation* will be the diagnosis. If stools are frequent and perhaps a little loose and very putrid, *masked* or *latent constipation* may be the term.

But in all cases the fault is the same—stasis or delay in the disposal of the food residues and wastes, and the various morbid conditions resulting from infection growing out of putrefactive changes and the growth of pernicious bacteria in the crippled colon.

Mechanical Obstructions

In a small number of very obstinate cases, chronic constipation is due to mechanical obstruction at some point along the food canal. This results in absorption of water and excessive dryness of the feces, causing delay or even obstruction.

Pregnancy, extreme retroversion of the uterus, an enlarged and painful prostate, malignant or other growths in or about the rectum, and, in women, rectocele from laceration of the perineum, are causes of interference with the proper action of the defecating mechanism.

The usual result of this defective action is

to leave a quantity of feces in the rectum or pelvic colon or in both cavities.

The retained feces become dry and hard, sometimes to a surprising degree, and form a mechanical obstruction that results in a damming back of the feces, which are left to accumulate in sections of the colon higher up.

The bowel may be narrowed by the contraction of the scar left behind by a healed ulcer due to tuberculosis, typhoid fever or other cause. When such strictures are present, the peristaltic movements of the intestine are often so strong as to be visible in a thin patient through the abdominal walls.

Cancer of the colon is not infrequent, constituting about 9 per cent of all cancers. The disease occurs most frequently in the cecum or ascending colon, and next most frequently in the rectum or pelvic colon, points at which the greatest stagnation of residues most often occurs.

Such an affection of the colon is not infrequently secondary to cancer in some other location. When cancer exists or has existed in the breast, stomach or elsewhere, obstinate constipation should lead to a careful physical examination, including an X-ray of the colon with special reference to the presence of organic obstruction.

The passage from the colon to the rectum, which is closed and opened by the falling and rising of the pelvic loop, is sometimes obstructed

by thickening due to inflammation or ulceration. The pelvic colon may become adherent to the pelvic floor and be prevented from rising, thus obstructing the passage of feces into the rectum. Accumulation of feces in the lower bowel above the rectum then takes place.

VISUALIZING THE CRIPPLED COLON

Until recent years the colon was one of the least understood of the large viscera. Because of the lack of accurate information respecting the nature and causes of its serious disorders, constipation was regarded as a hydra-headed monster, to be attacked by shot-gun methods. But within the last twenty years a great flood of light has illuminated this darkest corner of clinical medicine. By means of the X-ray and by many self-sacrificing efforts on the part of Holzknecht, Hurst, Case and others, not only the colon but the whole alimentary tract may now be visualized, and organic and functional changes studied with such facility that very complete and satisfactory information is, in the hands of experts, readily obtainable. In fact, the information that may be obtained by a careful X-ray study of the interior of the body, especially of the abdomen, is often of greater importance and value than might be learned by opening the abdomen and viewing the parts with the eye. The X-ray gives information about conditions that are beyond the reach of the eye even with the organs in sight.

The following description of what is disclosed by an X-ray examination is taken from the

writer's work entitled, *The Itinerary of a Breakfast*:*

What the X-Ray Expert Sees

An X-ray examination of a person without special preparation would usually show very little respecting the stomach or intestine, for the reason that these parts are practically transparent to the X-ray. Special preparation of the subject must be made. This special preparation consists of two things: Complete emptying of the stomach and intestine and the giving of a special meal. This usually consists of a pint of gruel of some sort or a couple of glasses of buttermilk to which has been added an ounce or two of bismuth or barium in fine powder. These mineral substances, as well as others, are opaque to the X-ray; that is, they cast a shadow. The stomach and intestines being hollow organs, the shadow formed by the opaque meal takes the form of the stomach or of that part of the intestine in which it appears.

When a person who has taken an opaque meal is placed in the X-ray apparatus, the shadow of the meal is thrown upon a screen under the eye of the observer, who is thus able to note the location of the meal, the form of the part in which it is located, and to compare it with the normal; also to observe the changes in form and location that are always taking place.

*Funk and Wagnalls Company, New York, 1926.

The observer begins his examination by placing the subject between the X-ray tube and a fluorescent screen, and seats himself upon a stool in front of the screen. The subject is then given the test meal. As he swallows it, the expert watches the behavior of the stomach as each morsel enters. In health, everything proceeds in the most orderly fashion. As one morsel succeeds another, it passes along a very definite course until it reaches a state of rest and is lost in the accumulating mass. Any deviation from the normal standard is quickly noted and recorded.

The observer notes with the greatest care the behavior of the stomach as the food passes out of the pylorus, and of the duodenum and small intestine as the food passes into them. The action of the pylorus is watched with this special care because it is at or near this point that many of the most troublesome changes in the stomach occur. There may be deformities due to ulcer or cancer, obstruction, or other departures from the normal. The duodenum is carefully scrutinized for the presence of ulcer or adhesions that may obstruct or delay the passage of food.

After a thorough initial scrutiny, the subject is released and asked to return at stated intervals during the day, when the observations made show the progress of the test meal along the road from stomach to colon.

The observations are renewed the next day, at less frequent intervals, to note the length of time

the food residues remain in the colon and any obstructive conditions that may exist. The ileocecal valve, the cecum, the appendix, the several parts of the colon—ascending, transverse, descending and pelvic colon and the rectum—all are carefully inspected.

How Adhesions are Discovered

By means of pressure applied at various points, the presence or absence of adhesions is determined. When adhesions are present, the motility of the various organs is lessened; that is, they cannot be moved about as freely as in normal conditions. For example, when ulcers of the duodenum of a serious character are present, it is not uncommon for the X-ray expert to find adhesions about the duodenum that bind it and restrict the mobility of the stomach. In chronic inflammation of the gall-bladder, the adjacent parts—stomach, liver, duodenum and sometimes the colon and other parts—are very liable to be bound tightly together by adhesions.

The small intestine, the cecum, the appendix, the transverse colon and the pelvic colon are also studied with great care with reference to adhesions, which in these parts are often the source of great mischief and chronic disorders, especially autointoxication from most obstinate constipation.

The size and form of the various parts of the

colon are of great significance, and are most carefully noted, as well as the position of the several parts. The X-ray pictures shown on pages 18 and 352 illustrate better than any description some of the various wonderful things that a really expert roentgenologist is able to see by means of the X-ray.

The patient is examined at stated intervals until the last trace of bismuth has disappeared from the alimentary tract. Sometimes a diseased appendix retains traces of bismuth for several days after it has disappeared from other parts.

The Barium Enema

Finally a bismuth enema is given, and the expert watches the behavior of the colon as the enema enters. This part of the examination is highly important, as it may reveal the presence of cancer or of adhesions or other causes of mechanical obstruction, as well as deformities of the gut, pouches, dilatations, "kinks," etc. Also, in many cases, it may show incompetency of the ileocecal valve.

Roentgenograms Reveal Conditions Not Otherwise Discoverable

The stomach and intestinal movements are not so rapid, however, but that the X-ray can not only catch them on the screen but record them on a photographic plate. Besides the fluoroscopic observations, plates are made, roentgeno-

grams, which reveal conditions not otherwise discoverable and form a permanent record.

Only Well-Trained Expert Can Interpret X-Ray Findings

But emphasis should be laid upon the fact that an X-ray apparatus alone is not sufficient to secure useful information. A well-trained X-ray expert, as well as an up-to-date apparatus, must be on the job. The X-ray makes only shadows. The expert must interpret the shadows. Long years of training, and education of the eye to observe fine distinctions of light and shade, also deep study of physiology and pathology, as well as of the physics and the technique of the X-ray, are essential to success. Only such an expert can be trusted.

A tyro misinterprets what he sees. The minute indications of disease he overlooks. Unusual but perfectly normal appearances he mistakes for cancer or some other dreadful condition, for which he urges immediate operation. Unfortunately the country is full of X-ray tyros, due to the commercial activity of certain machine manufacturers. It is safe to say that at the present moment the conclusions drawn from the majority of X-ray examinations of the colon are altogether unreliable and worthless, if not positively misleading and a menace to the patient's welfare if made a basis for active treatment or operation.

THE ALIMENTARY RESIDUES

The composition of the colon contents, the feces or stools, is very complicated and highly variable, depending largely upon the character of the food and the rate at which it passes through the intestinal tube.

A fact often overlooked is that the intestine is an excretory organ. Although the extent of the intestinal mucous covering is only seven square feet, about one-third that of the skin, there is reason for believing that its importance as an excretory outlet is fully as great as that of the skin and probably much greater. By the researches of Roger and others, it has been shown that the mucous membrane of the stomach and intestine removes from the body some of the most deadly poisons that are produced in its tissues, or that may be introduced from without. If, for example, a quarter of a grain of morphia is injected underneath the skin, a large part of the poison will be found in the stomach and intestine within a half hour. This excretion of poisons appears, in the light of recent researches, to be one of the important offices of the stomach. Mucus and the excretory substances thrown off by the mucous membrane of the intestine are, therefore, important constituents of the stools.

The liver, the largest excretory organ in the body, discharges into the upper end of the small intestine fifteen or twenty ounces of bile every twenty-four hours. It is through the bile that the body rids itself of alkaline wastes, some of which are so highly poisonous in character that the bile, as shown by Bouchard, is six times as poisonous as the urine. It produces poison enough within ten hours to cause death.

In addition, there are small amounts of the various food principles, also water, besides the remains of digestive juices, especially of the pancreatic juice. Calcium, iron and other mineral elements that are no longer needed in the body also are excreted by the colon. These are the normal constituents of the colon contents.

According to Akeley, the colon of the Mount Mikeno gorillas, which still adhere to the typical bill of fare of the primate family, contains nothing more than these normal elements. Far different is the case with most human colons. Besides the normal colon contents are to be found animal and vegetable parasites in countless numbers, together with their poisonous excretory products. These parasites are scavengers, "wild" microorganisms which have invaded the body and become domiciled in the colon as the result of an unwholesome dietary and of careless bowel habits whereby the body residues have been left to stagnate in the colon so long that they have acquired highly loathsome and

repellent qualities. Modern researches have shown that these "wild" inhabitants of the human intestine are directly and indirectly one of the most potent of all sources of human misery and suffering.

Nature has provided us, however, with another class of intestinal germs, another flora, that combat the "wild" bacteria and displace them. This warfare, carried on within our bodies, is by far the most important of all the conflicts in which human beings are concerned, affecting human welfare—social and moral as well as physical—more profoundly than all the wars of history combined. This battle of the flora will be studied in succeeding chapters.

The Battle of the Flora

The word *flora* is a Latin term meaning flower. The class of plants, trees, shrubs, flowers, weeds, ferns, mosses, fungi, etc., that predominates in a particular locality constitutes its flora. Germs are plants of the lowest order. The germs that grow in the small intestine and the colon are designated as their flora.

Modern scientific investigations, beginning with the researches of Metchnikoff, have shown that the colon is a veritable hotbed of germs. Their number is something prodigious. They sometimes constitute from one-third to one-half the total weight of the dried feces. Strassburger estimates the weight of the microbes produced in

the intestines in a single day at not less than one-quarter of an ounce, and the number more than one hundred trillions. Kendall estimates the number of germs, good and bad—mostly bad—that grow in the intestine daily and that are discharged in the stools, to be not less than thirty million millions. Day and night these microbe enemies are being produced at the rate of three hundred millions every second.

Fermentation and Putrefaction

The fiat of Holy Writ, "Dust thou art and unto dust shalt thou return," applies to all living things. Every living plant or animal sooner or later dies and returns to "dust." Destructive germs are the principal means by which the bodies of living things are thus disintegrated.

There are two principal competitive processes by which this destructive work is accomplished. One of these is known as *fermentation*. The other is called *putrefaction*. Both of these are natural processes that develop spontaneously whenever conditions are favorable, for the reason that the germs which give rise to them are everywhere present. Dryness and cold stop each of these processes. Because of this, perishable substances may readily be preserved by drying or by refrigeration.

Carbohydrate substances, such as fruits and grains, as well as sugar, starch and milk, will sour or take on the fermentation process spon-

taneously, or without the addition of germ cultures, provided the proper degree of warmth and moisture are present. On the other hand, protein substances, such as beefsteak and eggs and other foods rich in protein, will as readily undergo putrefaction, instead of fermentation, in the presence of warmth and moisture. Great care to prevent these destructive changes in foodstuffs is constantly necessary.

The colon is a receptacle for undigested food remnants, and the same changes take place in it as occur in the same sort of foodstuffs outside of the body. Foods that ferment outside of the body ferment in the colon. Foods that putrefy in the pantry or the storeroom also putrefy in the colon. The conditions of warmth and moisture in the colon favor these destructive changes to a very high degree.

In addition to the food remnants, the bile, mucus and other secretions of the intestine and the adjacent glands also undergo putrefaction if not promptly dismissed.

Antagonistic Processes

These two germ processes, fermentation and putrefaction, are unlike and antagonistic. The following are points of difference and opposition:

1. Fermentation concerns itself with carbohydrates, starch, sugar and dextrin, together with fruits, grains, milk and other substances

rich in these elements. Putrefaction concerns itself with substances rich in protein, such as meat, fish, shellfish and eggs.

2. Fermentation produces acids. Putrefaction produces ammonia and other alkaline substances.

3. The products of fermentation are for the most part harmless to the body or comparatively so, while the products of putrefaction are highly poisonous.

4. The products of fermentation stimulate intestinal activity and so aid bowel action, while the products of putrefaction paralyze the bowel and cause constipation.

5. Fermentative germs thrive in the presence of acids. The germs themselves produce lactic and other acids. These are the germs that cause milk to sour. They are sometimes called *acidophile* or "acid-loving" germs because they thrive in the presence of acids. Putrefactive germs thrive in the presence of alkalies, but cease to grow and die in the presence of acids. As little as one-tenth of one per cent of acid stops the growth of the dangerous Welch's bacillus.

Fermentation therefore combats putrefaction. There is thus a natural antagonism, a veritable warfare, in fact, between fermentative and putrefactive bacteria. The conditions that are most favorable for one class are most unfavorable for the other. This fact, long

known to bacteriologists, is of the highest importance to human life and health.

An illustration of its practical value is seen in its application by pioneer housewives of our western frontier a generation ago in the use of sour milk as a means of preserving fresh meat. The wandering Arabs resort to the same measure for preserving their mutton chops, by immersing them in camel's milk. The migratory Tartars preserve meat in mare's milk in the same way.

Poisons Produced by a Putrefactive Flora

It is not a matter of indifference as to which of these processes occurs in the colon, since one, fermentation, produces harmless acids that aid bowel action, while the other, putrefaction, produces highly virulent poisons that paralyze the bowel and cause injury to every organ of the body.

Certain species of the putrefactive flora produce alcohol, formic acid, butyric acid, and other substances that are unquestionably toxic although not appreciably so in the small quantities in which they are produced in the intestine under strictly normal conditions. But others of the putrefactive flora, scores of species being found in the intestine, produce ammonia and other alkaloid substances that are capable of causing deadly effects even in very minute quantities.

Everyone is familiar with the unpleasant effects of the volatile substances that emanate from a mass of putrefying flesh. Headache, nausea and other symptoms may result from the odors alone that arise from putrescent substances. These volatile substances are poisonous, but other non-volatile poisons present are much more active. Some are almost as powerful as the venoms of snakes, which they resemble in chemical composition. Distaso points out more than twenty species of putrefactive bacteria that are found in the stools of flesh eaters, all of which produce very highly toxic products.

In more than one hundred and sixty different species of bacteria found in the feces by Roger, more than one-third were found to possess pathogenic or disease-producing properties.

The following is a list of the various poisons mentioned by the participants in the discussion of autointoxication by the Royal Society of Medicine in London: *Indol, skatol, phenol, cresol, indican, sulphuretted hydrogen, ammonia, histidin, urobilin, methylmercaptan, tetramethylendiamin, pentamethylendiamin, putrescin, cadaverin, lecithin, neurin, cholin, muscarin, butyric acid, beta-imidazolylethylamin, methylguanidin, ptomatropin, botulin, mytilotoxin, tyramin, agmatin, tryptophan, sepsin, indoylethylamin, sulphemoglobin.*

Of these poisons, several produce highly toxic effects, even in small quantities.

According to Burnet, the bacteria that are chiefly active in producing putrefaction in the intestine are *C. butyricum*, *C. sporogenes* and *C. Welchii*. *B. coli* is also more or less injurious because it causes putrefaction of certain products of digestion and produces indol, phenol, mercaptan and sulphuretted hydrogen, the very products which cause the changes seen in premature old age. This has been proved by experiments upon rabbits and monkeys.

Clostridium Welchii, or Welch's Bacillus

One of the most common and abundant of the poison-producing germs of the colon is the *Clostridium Welchii*, also known as Welch's bacillus, which produces enormous quantities of gas as well as highly active poisons. This is the germ that caused the gas gangrene that was so active during the war in causing many deaths.

This microbe, as well as the other highly putrefactive organisms of the feces, is found in an active growing condition in butcher's meat and fresh flesh foods of all sorts, as well as in salt and dried fish.

Herter fed a cat on raw meat and found the entire intestinal tract infected by the Welch's bacillus in great numbers. Examination of the stools of lions, tigers, wolves, dogs and other carnivorous animals showed pronounced infection with the Welch's bacillus. A guinea pig inoculated with the feces of these animals died in 15

to 18 hours. Examination of the stools of the buffalo, goat, camel, elephant and horse showed this organism only in the case of the buffalo.

Welch's bacillus is found in commercial milk. It is not destroyed by pasteurization. Ordinarily it does little harm in unpasteurized milk, however, for the reason that it is prevented from developing by the acid-forming germs that are present. But the latter are killed by the pasteurizing process, and so if pasteurized milk is allowed to stand in a warm place for a few hours, the *C. Welchii* may develop with no acid-forming germs to hinder them. The milk may thus become poisonous and may even cause diarrhea and death.

Welch's bacillus is found in the stools of most adult persons (Herter). It is a dangerous organism, and is probably the most injurious of the various germ enemies that infest the human colon. The effort to change the intestinal flora is, in fact, a battle between the *C. Welchii* and the protective acid-forming or so-called aciduric organisms, the chief of which, in adults, is the *B. acidophilus*.

A certain amount of gas is natural. The presence of gas in the intestine is an aid to peristalsis. This is especially true of the large intestine. Gas is most readily formed by bacteria from cooked starch or sugar, but may be formed from cellulose and from protein. Odorless gas is usually formed from starch or sugar, inflammable

gas from cellulose and gas having a foul odor from protein.

The Colon Bacterium

The colon bacillus, discovered by Fränkel in 1885 and the next year more fully described by Escherich, was soon found to be active in producing a variety of toxic bodies, especially indol, phenol, ammonia and hydrogen sulphid.

Metchnikoff and his pupils proved that indol, when administered daily in very minute doses to small animals for several months, gives rise to atheroma and other degenerative changes. This led them to regard the colon bacillus as the cause of old age, a notion that seemed to be supported by the fact that the animals with the longest colons have the shortest lives.

Lauder Brunton noted that "the bacillus coli seems to have a special power of producing fatigue toxins, and many people in whose intestines it exists in great abundance suffer from constant weariness and fatigue." Professor Benjamin Lee of Columbia University, studying specimens of indol and skatol sent to him by Herter for the purpose, found these products of putrefaction to be active fatigue poisons. While only a small share of the bacteria found in the feces are alive (one per cent, according to Strassburger), all have been alive and each has produced its portion of poisonous substances.

In addition to the various poisons produced and thrown off by living germs, many germs produce so-called endotoxins, which are retained in the bodies of the germs so long as they are alive but are released when they die and their bodies are broken up. These endotoxins are often highly toxic. It is thus a most significant fact that many million millions of these minute poison factories are broken up and their poisons set free every twenty-four hours. The endotoxins of the colon bacillus appear to be even more active poisons than its excretions. Killed cultures injected into rabbits produced death within a few hours. This fact is highly significant when it is remembered that a very large proportion of the bacteria found in fresh stools are dead, so that endotoxins may in some cases be a more active factor in producing morbid effects than the products of the living organisms.

The Infant's Aciduric Flora

Wise old Mother Nature has been raising babies for a long time. For many thousands of years she has been looking out for the nurslings of all sorts of mammals, from tiny kangaroo babies to the large offspring of elephants and whales, and she is a most experienced baby expert.

Every infant, human or animal, is born meticulously free from germs of every sort. Within three days, however, its body, externally

and internally, is teeming with germ life of many species. Its stools show germs that cause fermentation, that is, acid-producing germs; but they also show germs that cause decay or putrefaction, mischief-making germs that give rise to deadly toxins and poisonous pigments, gases and foul-smelling volatile poisons; also many sorts of streptococci, "wild" or predatory organisms, which under certain conditions give rise to disease, form pus and cause inflammations and suppurations, even abscesses.

When the intestinal tract is invaded by these various germs, and the stools show great numbers of the putrefactive and predatory, disease-producing germs, it is a critical moment for the infant; if something is not done quickly, it must succumb, overwhelmed by these germ enemies.

At this juncture, however, Nature comes to the rescue. She puts into the infant's first food, the mother's milk, a wonderful sugar, lactose, which feeds the fermentative, acid-producing germs, in particular the *B. acidophilus* and the *B. bifidus*. Since putrefactive germs cannot grow in the presence of acids, they are soon overwhelmed by starvation and by the acid medium in which they find themselves, and the acid-producing germs become dominant; that is, the flora of the infantile intestine becomes aciduric.

The situation in the colon of a healthy infant may be compared to that of a front lawn

which is so thickly covered with a luxuriant growth of grass that there is no room for the development of weeds.

In examination of the stools of very young infants, Herter found that *B. bifidus*, an acidophile organism, was always present in the first stools, thus serving as a protection against the entrance of putrefactive bacteria. The same acute observer noted that the stools of a healthy nursing infant may be placed in a closed test tube in an incubator for several weeks without the development of putrefaction, and this is true even when the material has been inoculated with a highly putrefactive organism such as *B. putrificus*.

The acid-forming bacteria are evidently intended by Nature to serve the infant organism as a defense against the harmful germs that are constantly invading it. It is evidently for this reason that mother's milk contains so large a proportion of lactose, which feeds these protective germs.

When a nursing child is put upon the bottle, it suffers because of the insufficient amount of lactose supplied by cow's milk. Mother's milk contains 6 per cent of lactose, or about 2 ounces to the quart; while cow's milk contains only two-thirds as much. When the milk is diluted with an equal amount of water, the infant's daily dose of lactose becomes only two-thirds of an ounce, less than half the normal

and necessary amount. There is, consequently, an immediate change in the stools. After weaning or when it is bottle fed, the infant's stools become foul-smelling and putrefactive, with poison-forming germs abounding. And then the baby is subject to attacks of indigestion. Constipation alternates with diarrhea. Mucus, indicating colitis, appears in the stools. Colic pains are frequent. The tongue is coated, the breath is bad. The little one does not sleep well at night, is restless, fretful and obviously ill.

Infantile convulsions, night terrors, grinding the teeth during sleep, fitfulness, feverishness and numerous other symptoms appear.

As the child advances in years, it gets less lactose in proportion to its size and food intake, besides ingesting increasing numbers of pernicious bacteria in ordinary food and drink. Street and house dust are loaded with germs. Commercial milk, butcher's meat, fish, oysters, stale eggs, certain kinds of cheese, such as Limburger, abound in putrefactive germs of the colon type. Hamburger steak and some other meats often contain more colon germs than the fresh droppings of animals. A putrefactive flora becomes dominant, therefore, with the inevitable handicaps to health.

When the protective influence of lactose is lost, the intestinal troubles that follow are usually charged to errors in feeding, and doubtless correctly so in many cases, but the deficiency of

lactose is a more important factor than has heretofore been suspected.

Of interest in this connection are the observations of Norton and Shohl on the reaction of the stools of new-born infants*. These investigators showed the first-day stools of new-born infants, the meconium, to be neutral (pH 6.8 to 7.0). After five day's nursing, receiving 6 per cent lactose in mother's milk, the stools became decidedly acid (pH 4.8 to 5.00). Even partial feeding on modified cow's milk (2 to 4 per cent lactose) quickly reduced the acidity nearly or quite to neutrality (pH 6.5 to 7.5).

Laboratory Examination Important

When a physician is called to see a sick infant, he first of all inquires as to the bowel passages, and the experienced nurse or mother always preserves the infant's napkins to show to the doctor when he comes. If the bowel passages have the usual consistency, a yellowish color and a slightly acid odor, the doctor knows that there is no serious disturbance of digestion. If, however, the stools are dark or brownish in color and have a foul or putrid odor, these facts are sufficient to show to the physician or experienced nurse that the infant is ill. Any physician who should omit to examine the stools of an infant would be regarded either as ignorant or as quite remiss in his duty.

*Reaction of Stools of Newborn Infants, *American Journal of Diseases of Children*, August, 1927.

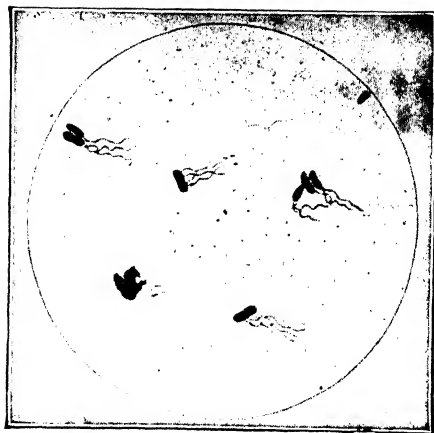
It is very strange indeed, therefore, that until quite recently almost no attention has been given to the stools of adults, and even at the present time physicians quite rarely take the trouble to make anything like a thorough investigation of bowel passages. The doctor usually contents himself by inquiring if the bowels have moved. If questioned concerning the character of their stools, most patients are unable to give any information of importance.

The stools of a person who lives biologically, that is, whose diet is restricted to foodstuffs that do not readily undergo putrefaction—such as fruits, grains, nuts, roots, green vegetables and milk—are often almost odorless. If not odorless in these cases, they may have an acid odor, like the bowel discharges of a young breast-fed infant.

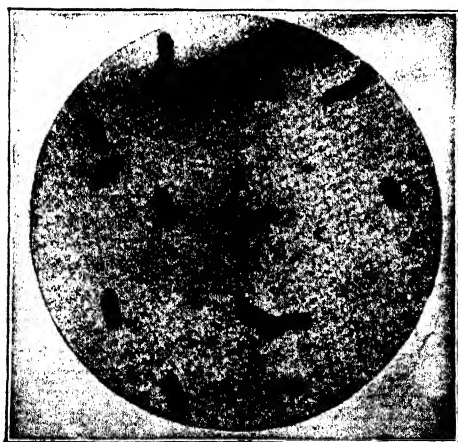
On the mixed diet of unscientific foods in common use, the residues are dark brown and have a sickening, sometimes ammoniacal odor.

The difference is the same as that between the stools of a dog and those of a sheep, and for the same reason. In the case of the dog and the meat-eater, there are always to be found fragments of decaying flesh in the colon; while in that of the sheep, the nursing infant or the flesh-abstainer, the food residues consist chiefly of substances which ferment, producing acids, but which do not undergo putrefaction.

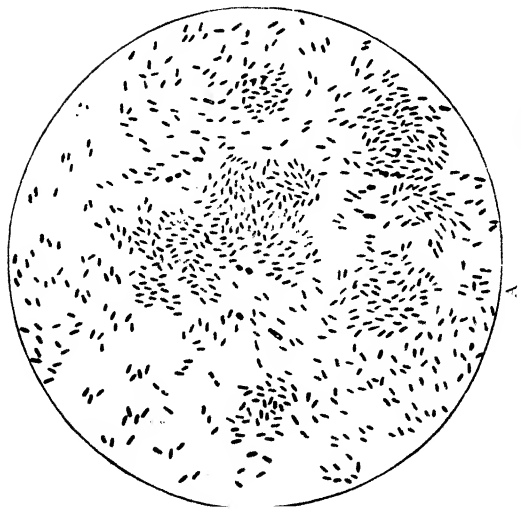
The real character of the residues produced



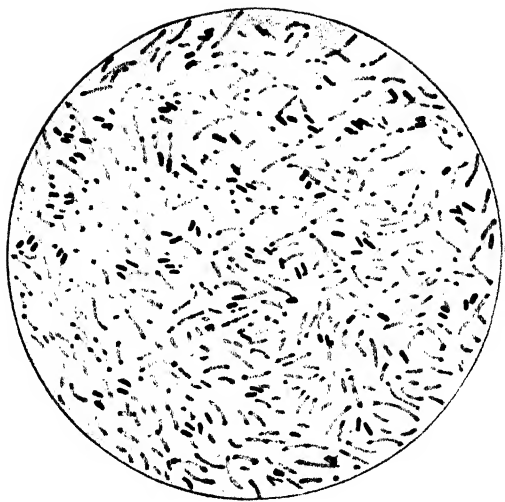
Gas-Forming Organisms, *C. Welchii* (Hicks)



Colon Bacilli
INTESTINAL BACTERIA



A



B

FERMENTATIVE AND PUTREFACTIVE ORGANISMS

The red color indicates species that produce putrefaction and give rise to toxins; the blue color, acid-forming organisms that are friendly. A. Stool from a child suffering from intestinal toxemia. B. Same case ten days later after flora was changed by a change of diet and other measures.

by a constipated person cannot be judged by an examination of the hard, dry masses that are discharged from the lower bowel, for the reason that the noxious substances that they contained have been absorbed higher up in the bowel.

While something can be learned from the general appearance of the residues, for really accurate information it is necessary to submit a specimen of them to a thorough laboratory investigation at the hands of an expert in this particular line of research.

It is not going too far to say that a thorough examination of the stools should be made in every case of chronic disease. This practice has already been instituted in a few institutions and the time cannot be far distant when such examinations will be a routine practice with all physicians who attempt to keep pace with the advance of medical science.

How the Flora is Studied

The number and variety of the organisms present in the colon contents is so great that many months would be required for the complete study of a single stool. The proportion of putrefactive to aciduric flora may be judged, however, by the chemical reaction of the colon contents, the putrefactive flora producing a strongly alkaline reaction, and the aciduric an acid reaction. This difference in reaction is one

of the most important of all the various characteristics of the colon contents, since it suggests the type of flora present, and thus points at once to its toxicity or non-toxicity.

The above statement as to acids does not apply, however, to butyric acid, which is often present in highly putrefactive stools, to which it gives a rancid odor, the result of a "butyric putrefaction" caused by *C. Welchii* and *B. butyricus*.

Careful microscopic examination is also necessary, of course, to determine the presence or absence of parasites. In the South, hookworm disease is not confined to the mountain districts. Evidence of the presence of hookworms has often been found in the stools of well-to-do people living in large southern cities. The tapeworm parasite occurs in all parts of the United States. Parasitic amœbæ are encountered with increasing frequency.

AUTOINTOXICATION—TOXEMIA DUE TO ABSORPTION OF PUTRE- FACTION PRODUCTS

Since the publication by Bouchard of his work on autointoxication in 1887, there has been a growing appreciation of the importance of the colon as an etiological factor in relation to a great number of morbid conditions, chiefly chronic, the causes of which had previously been admittedly vague and obscure.

The significance of the colon as a factor in disease is by no means a modern notion, for Herodotus tells us that the ancient Egyptians sought to keep themselves in good health by a monthly purgation, and Hippocrates emphasizes the importance of the enema as a therapeutic agent. Laxatives are the oldest and most universally used of drugs, and the enema is employed by the most primitive of people. The "opening purge" is the most frequently recurring recommendation to be found in the works of the older medical writers. Some of the popular mineral spring resorts have been famous for centuries. These are among the many convincing evidences of the universal recognition of the important relation of conditions of the colon to human morbidity. The treatment of constipation and disorders recognized as being associa-

ted with this condition have always constituted a very large part of the work of the family physician. That the results of his efforts have been far from satisfactory is clearly evidenced by the vast number of alleged remedies that are in use, and the constant appearance of new ones claimed to be superior.

Defense against Poisons

Schmidt has pointed out that there is normally no putrefaction in the small intestine, putrefactive processes being confined wholly to the colon, and being prevented from extending into the small intestine by the ileocecal valve. When the valve is incompetent, putrefactive processes may extend, however, not only by continuity but by reflux from the colon into the small intestine of the putrefying material itself. In operating upon the intestine, the writer has in several cases found the small intestine half filled with fecal matter of the consistency of putty, and at points several feet above the ileocecal valve.

Schmidt has shown, also, that the absorption of indican and other products of putrefaction is far greater when putrefaction occurs in the small intestine than when this condition exists only in the colon. The small intestine is evidently not so well prepared as the colon to defend the body against the attacks of putrefactive, toxin-producing bacteria. The mucous membrane of the colon is a very efficient filter, and absorption from

the colon is very slow. The reverse is true, however, of the small intestine, in which area absorbents are of course plentiful, this being the body's natural feeding ground.

The slow rate of absorption in the colon is doubtless one reason why many people seem to tolerate constipation during many years with apparently little or no injury. The more pronounced evidences of autointoxication only make their appearance when, through dilatation of the cecum and ascending colon, the ileocolic junction is stretched widely open so that the ileocecal valve becomes incompetent, permitting putrefying wastes to pass into the small intestine, where absorption takes place with great rapidity, resulting in pollution of the blood stream with the products of putrefaction and therefore in the imposition of an enormous amount of extra work upon the liver and kidneys.

While the healthy mucous membrane of the colon is a barrier against germs and germ poisons, this is not true when the membrane has been damaged by colitis. Says Herter, "In experiments made many years ago with indol, it was found that the epithelium of the digestive tract possesses in a high degree the capacity to bind indol in such a way that this substance cannot be recovered by distillation. I think it likely that in cases where there is excessive production and absorption of indol in the intestinal tract that the epithelium acts as a protective agency

to the organism as a whole. This action of the epithelial cells is certainly not confined to indol."

As an example of the toxicity of putrefactive stools, an infusion from a putrid stool, seething with the putrefaction of undigested remnants of protein foodstuffs such as beefsteak, mutton chops, pork, etc., will kill an animal very quickly. Such a stool is swarming with deadly bacteria, and is saturated with their poisons. Yet often these putrid masses remain in the body for many hours or even days, during which time the absorbents of the intestine are constantly sucking up the poisons and distributing them throughout the body.

It should be understood that these findings are not mere theories, but are the results of demonstration in actual practice by eminent physicians.

Different Types of Intestinal Toxemia

1. *The indolic type* Herter called stools in which he found a large amount of indican in the urine. In these cases there was, doubtless, stasis in the small intestine and incompetency of the ileocecal valve. The indican is produced by *B. coli* and *C. butyricum*, the colon bacillus acting upon partially digested proteins and the putrificus upon the proteins that have escaped digestion and absorption.

These patients suffer from headaches. There

is usually marked dilatation of the cecum, often with adhesions of the cecum or the appendix. In many cases operations for removal of the appendix have been performed without benefit. The bowel movements are often loose and frequent. Patients not infrequently have regular daily highly putrid stools.

Doctors Richard and Howland demonstrated the highly toxic effects of indol by first sensitizing animals or lowering their resistance by the injection of minute quantities of potassium cyanid, the amount of cyanid injected being so small as to produce no noticeable effect. In animals so prepared, indol was found to produce highly toxic effects in very minute doses.

2. *The butyric type* was the term applied by Herter to stools that have a very strong rancid odor of butyric acid. Bacteriological examination showed the dominance of Welch's gas-forming bacillus. *C. butyricum* was also often present.

The reaction of the stool may be acid, due to the large amount of butyric acid, and indol may be wholly absent; hence indican will not appear in the urine in any quantity.

Experiments showed, also, that the Welch's bacillus produces substances capable of destroying the red blood cells. The total number of blood cells is reduced in these cases. Later the hemoglobin is reduced in greater proportion than the number of red cells.

These patients show symptoms of senility, such as brown spots on the hands and face, general pigmentation of the skin, loss of suppleness of the skin, wrinkling of the skin of the face and hands.

The butyric acid type of intoxication is very commonly associated with colitis. The stools show an abundance of thick, opaque mucus, frequently in the form of flakes or casts and not infrequently mixed with pus, and are very offensive. Welch's bacillus is abundant.

3. *A combination of the two classes described*, that is, of the indolic and butyric acid types of intestinal intoxication, constitutes the third class, which is the most severe of all forms of intestinal toxemia. These patients have usually suffered for many years and have frequently depended during that time upon mineral waters and other laxatives of various sorts for bowel movements. They are considerably depreciated physically, often greatly depressed mentally. Not infrequently they develop manic-depressive insanity with suicidal tendencies. Many of these patients are classed as neurasthenics. Not a few find refuge in asylums for the insane. Not a small percentage of these cases drift into drug habits as the result of extreme nervous depression, toxic neuralgia, insomnia and other miseries which their depreciated morale renders them unable to endure.

The Margin of Safety

At first the evil effects of this systematic poisoning may not appear. Indeed, many years may elapse before serious consequences make themselves known. The reason for this is that the body is provided with means of defense.

The liver, the largest gland in the body, possesses a remarkable capacity for destroying poisons. There are various other organs of the body, such as the glands of internal secretion of which the thyroid gland is a conspicuous example, that aid in the destruction of poisons. The kidneys both destroy and eliminate poisons and the skin and the lungs also share in this protective work. When the intestinal mucous membrane is intact, it is able to exclude most of the intestinal poisons, acting like a filter, which permits only the useful substances to enter the blood.

So long as these defensive powers of the body remain intact, enormous quantities of poisons may be produced in the intestine without apparently evil results. This is one reason why some constipated persons seem to suffer no ill effects from intestinal inactivity.

In every case, however, the time comes sooner or later when the intestinal filter no longer acts efficiently in excluding poisonous matters, when the liver is no longer able to destroy all the poisons brought to the blood, when the thyroid and other glands have also become worn out with

overwork, when the kidneys have ceased to maintain the normal degree of blood purity by the excretion of poisons.

When the symptoms of toxemia appear, the fact shows that the poison-destroying mechanism of the body has broken down; that the great margin of safety that Nature provides against emergencies has been used up; that the defenses against autotoxins have been swept away, and that the tissues are flooded with these subtle and mysterious disease-producing elements.

Every organ and every function of the body is then definitely damaged. The poisons circulating in the blood irritate the walls of the blood vessels and cause first contraction and then hardening and degeneration, or arteriosclerosis. The brain and nerves show evidences of depression or irritation, according to the nature of the dominating poisons. Headaches, neuralgia, neuritis, paralysis, mental dullness, neurasthenia, even insanity, are the results. Diseases of the liver, thyroid gland and spleen develop. Skin diseases of various kinds and every sort of bodily derangement may be seen.

The reason bacteria with which we are continually in contact do not destroy us is because a certain degree of immunity is developed. When the number of bacteria absorbed is considerably larger than usual, which frequently occurs, the result is a noticeable disturbance, which may be manifested by depression and a

feeling of being out of sorts; or, in case the absorption is very large, by a chill with a slight rise of temperature.

The absorption of unusual quantities of bacteria may give rise to neuralgic pains, commonly termed neuritis, or to pains in the muscles or joints usually designated as rheumatism. When the invading germs colonize in some particular organ, the result may be cystitis or infection of the bladder, pyelitis, inflammation of the gall-bladder, chronic duodenitis and even duodenal ulcer, inflammation of the prostate or of the kidney, or any one or more of various other local infections.

Toxemia Universal

In civilized countries the colon is so abused or neglected that chronic autointoxication, or intestinal toxemia, has come to be a practically universal condition. Bryce of Birmingham, a well-known physician and medical author, recognizing this fact says:

"We lavish money on our houses to obtain perfect drainage for them, but we fail to secure it for ourselves. If the main drainage system of any house leaks, saturating the sub-soil with sewage matter, we soon put ourselves in communication with the sanitary authorities. Yet we permit the main excretory system of our bodies to harbor foul, stinking and putrefying substances, which overflow into all our tissues, flood-

ing them not only with living, disease-producing germs, but also with the poisonous excrements of these organisms, and are surprised and often aggrieved because we are stricken down with illness.

"For that is the effect of chronic intestinal stasis, and it is perfectly clear, by Doctor Kellogg's standard of intestinal activity (three evacuations daily) that we are all victims of colonic stagnation. This means that there is an excess of toxic material in the small intestine, with absorption into the circulation of a greater quantity of poisonous products than can be converted into harmless substances and excreted by the organs of defense."

Common Symptoms of Autointoxication

Among the symptoms that first appear when poisons are being absorbed from the colon, are fatigue, a tired feeling on rising, lack of initiative, inability to concentrate, sick headache, nervous headache, loss of appetite, coated tongue, "bilious" attacks, irregular action of the bowels, diarrhea, appendicitis, febrile attacks resembling malaria and insomnia.

As the system becomes more and more saturated with these poisons through the gradual overwork and therefore failure of the liver and kidneys, and through the constant multiplication of the poison-forming bacteria, other more chronic symptoms appear, such as constant head-

ache, mental confusion, neurasthenia, nervous exhaustion, gall-stones, hemorrhoids, emaciation, browning of the skin, particularly about the eyes, various skin diseases, especially acne, eczema, psoriasis and urticaria, also neuralgia, pain and stiffness of the joints.

After a time still worse conditions make their appearance, such as Bright's disease, sclerosis or hardening of the liver, dropsy, chronic rheumatism, rheumatic gout, tuberculosis, ulcer and cancer of the stomach and other gastric disorders. Many women supposed to be suffering from disorders peculiar to their sex are really suffering only from autointoxication, the natural result of inattention to the hygiene of the bowels.

Toxic Fatigue

Constipated persons are generally lacking in endurance. The chronic sufferers from constipation, colitis and autointoxication are notably lacking in stamina. Anything that tends to develop a state of acidosis by diminishing the alkalinity of the blood and body fluids, as does the absorption of intestinal poisons, at once becomes a cause of exhaustion and fatigue.

Sir Lauder Brunton long ago called attention to the colon as a source of fatigue poisons, an observation that has since been abundantly confirmed by many investigators.

Herter observed that the administration of

indol by the stomach was followed by a pronounced sense of muscular fatigue. He also observed that persons showing much indican in the urine often suffered greatly from a sense of exhaustion.

At the request of Herter, Professor Lee of Columbia University experimented upon various animals to test the effects of indol on muscle fatigue. He found the effect to be very pronounced, especially in the case of a warm-blooded animal, the cat, in which a solution of indol 1 part to 25,000 reduced the amount of work done in the ratio of 100 to 37.

Herter also observed that in cases of children subject to pronounced intestinal putrefaction there is a retardation of growth with abdominal distention and poisoning of the muscular system, shown by signs of weariness and slowness in learning to walk.

The writer's experience in dealing with a considerable number of tired business and professional men has convinced him that most of these men are not weary because they are overworked, but rather that work they once enjoyed and were able to do easily has become irksome and fatiguing because they are already loaded with toxins; that they are suffering from toxic fatigue, rather than from the normal fatigue that results from work and is quickly cured by rest.

Rest does not cure toxic fatigue. The patient

on rising in the morning feels more tired than when he went to bed because during the night the diminished activity of heart, liver and kidneys has resulted in an accumulation of toxins in the blood stream. He is intoxicated with colon poisons. He is not "tired" but "toxic."

The wretched feeling that many neurasthenics experience in the morning is usually due to constipation and the absorption of intestinal poisons. Case has noted that although the small intestine may be entirely empty at night, in the morning several feet of the intestine may be filled with fecal matters that have returned from the colon through an incompetent ileocecal valve. It is on this account that the colon should always be emptied before retiring. If necessary, an enema (consisting of two quarts of water at a temperature of 110° to 115°) should be taken.

All carnivorous animals suffer from autointoxication, and for this reason usually lack the endurance possessed in so remarkable a degree by vegetable-feeding animals. Roosevelt noted that a horse with a heavy man on his back was able to run down a fleeing lion in a mile and a half.

Flesh-abstaining athletes are conspicuously successful in endurance contests.

Bile Poisoning

Bile poisoning is one of the almost inevitable results of too long retained colon residues and of

their reflux into the small intestine, for the reason that mixed with these residues are several ounces of highly poisonous bile. The 20 ounces of bile filtered out of the blood by the liver each 24 hours is the most toxic of all the excretions. When evacuation is delayed, a large part of the excreted bile is reabsorbed. As this process continues day after day, the bile becomes more and more concentrated, more and more toxic, until the whole body suffers from chronic bile poisoning. Brunton, a famous London physician, was the first to call attention to the above facts, which the writer has verified in many cases.

The patient speaks of himself as being "bilious." While not in a strict sense scientific, the term "bilious" nevertheless describes a pretty clearly defined condition with which many people are, unhappily, only too familiar. The lack of appetite, sense of *malaise*, indisposition to mental or physical effort, inability to concentrate, drowsiness, often giddiness, coated tongue, unpleasant taste in the mouth, malodorous breath, inactivity of the bowels, dinginess of the skin, dark circles around the eyes, headache—all of these are symptoms of a state of profound toxemia.

The source of this toxemia is by the laity universally associated with a "sluggish liver." It is a common remark of such patients, "If I could only get rid of this bile, I am sure that I would be relieved." Not infrequently attacks

of biliousness are periodical and are associated with migraine or sick headache. Some persons have observed a sense of unusual well-being immediately after an attack in which there has been free vomiting of bile.

Many patients have discovered for themselves that an attack of so-called biliousness may sometimes be averted by a dose of salts, or free purgation produced by mineral waters or cathartic pills of some sort. It is a common practice with physicians, especially in the southern states, to relieve or avert an attack of biliousness by liberal doses of calomel. By vomiting or by free purgation, a considerable quantity of bile is gotten rid of.

In recent years a method has been perfected whereby the gall-bladder and liver may be drained of bile, the so-called non-surgical gall-bladder drainage. By this procedure many ounces, sometimes several pints, of bile may be removed. Patients usually feel greatly relieved, and not infrequently headaches and other toxic symptoms disappear when a large quantity of thick black bile has been removed.

Another feature that contributes to the excessive absorption of bile is a deficiency of gastric acid. One of the functions of the gastric acid is to precipitate, or render insoluble, the poisonous pigments and other toxic substances that are found in the bile. These are among the most highly poisonous substances found in the excre-

tions. When the gastric acid is present in sufficient amount, these poisons are thrown down in an insoluble form and are carried off with other waste matters; but when the gastric acid is deficient, these poisons remain soluble and are thus rapidly absorbed. If, in addition to this condition, constipation exists, which is very liable to be the case, the bile poisons naturally accumulate not only in the bile but in the blood stream and tissue fluids, producing a condition that may be called "chronic biliousness."

Even persons who suffer from an excess of gastric acid may have excessive absorption of bile if large quantities of soda are used to neutralize the gastric acid—a very common practice.

Persons whose bowels move freely and efficiently three times a day and whose flora is aciduric will not suffer from excessive absorption and concentration of bile. But constipated persons, including those whose bowels move but once a day, must always suffer from bile absorption, for the reason that the food residues and excretions, which are normally discharged in less than twenty hours from the time food is taken, being retained two or three days or even more, give abundant opportunity for the re-absorption not only of bile but of other excretions.

The permanent remedy for these conditions is to be found, not in the use of laxative or other

drugs, but in changing the intestinal flora and in such regulation of the diet as will prevent putrefaction of the food residues and secure frequent evacuation. When this is accomplished, all the symptoms of "biliousness" rapidly disappear. They do not reappear so long as normal conditions are maintained in the intestine.

This most desirable non-toxic condition of the intestine may easily be maintained by faithful adherence to an antitoxic regimen, and by the systematic use of such indispensable food accessories as psyllium seed, Lacto-Dextrin, bran or agar and mineral oil. Sometimes one alone of these invaluable aids is sufficient. Not infrequently all are necessary, to give a crippled colon all the help it needs, and in very obstinate cases the additional assistance of a daily hot enema at bedtime is required. The benefits experienced are ample compensation for the effort required.

Increased Reverse Peristalsis

Reversed peristalsis may be excited when there is an accumulation of fecal matter in the intestine. That reverse peristalsis sometimes becomes a troublesome factor, there is little room to doubt. Case and others have observed strong reverse movements beginning near the lower end of the colon when this part of the bowel was distended. Case has reported cases in which the reflux has extended even to the duodenum.

Treves, a London surgeon, reported a case in which castor oil and water colored with an anilin dye were vomited within ten minutes after they were introduced by enema into the colon. The surgeon thought such rapid movement of liquids from the rectum to the stomach must be impossible without the existence of an opening connecting the stomach with the colon. He accordingly operated, but to his surprise found the stomach and intestines to all appearance perfectly normal.

A number of other similar cases have been reported. In these cases the reverse movement of the intestine is apparently even more vigorous than the ordinary peristalsis in the normal direction.

These strong reverse movements may be caused by various morbid conditions, especially by chronic appendicitis, disease of the gall-bladder, duodenal ulcer, pregnancy, diseased conditions of the womb and ovaries and of the bladder and prostate.

The most common of all causes appears to be the accumulation of food residues in the colon. A great mass of facts demonstrated by laboratory research and culled from clinical observation supports this view.

Vomiting is undoubtedly the result of a reverse movement of the intestine. During X-ray observations, peristaltic waves have been seen to pass from the duodenum to the stomach. It

is impossible to account for the vomiting of fecal matters and substances introduced experimentally into the rectum except by the occurrence of reverse peristalsis.

Hippocrates recognized this fact, for he noted that purging usually ceases when vomiting begins. Purging has even been treated by the administration of emetics, and it has been found possible to nourish pregnant women suffering from prolonged vomiting by introducing nutritive enemas, which were apparently carried from the colon into the small intestine. Feeding in this manner will, of course, be facilitated by ileocecal valve incompetency, which exists in a large proportion of patients who have long suffered from constipation and a putrefactive flora.

Regurgitation is simply mild vomiting. The reverse peristaltic waves are too slight to produce the violent movements of vomiting, so that only small quantities of liquid are lifted. Distention of the colon gives rise to reverse waves of intensity sufficient to reach the stomach, although with a force barely sufficient to lift to the mouth small quantities of the stomach contents. The material may be either fresh food, on which the process of digestion has not yet begun, or highly acid gastric juice, or even duodenal fluids, bile and pancreatic juice, which, when the pylorus is open, may be carried upward to the esophagus.

Nausea without either vomiting or regurgitation is another symptom of mild reverse peristalsis. The accumulation of food residues in the colon is undoubtedly a very frequent cause of nausea, although it is entirely possible that the toxins absorbed from such putrefying residues may also give rise to it.

A sense of fulness is often complained of by chronic dyspeptics. They experience difficulty in eating because of this sense of fulness, which appears shortly after a few mouthfuls of food have been eaten. Cannon, Carlson and other observers have shown that the normal stomach gradually enlarges to accommodate the increasing volume of contents during the intake of food. This appears to be brought about by a reflex action, which causes gradual relaxation of both the gastric walls and the muscular walls of the abdomen. This reflex is apparently interfered with by a mild reversal of the normal peristaltic movements, in turn due to constipation and autointoxication. Distention of the colon may well give rise to this reversal.

In duodenal feeding, the too rapid introduction of foods will quickly develop the sense of fulness in the stomach although no food whatever has entered it. By waiting a few moments, especially by diversion of the mind from the condition present, as by pleasant conversation or the reading of the morning paper, the symptom will pass off and eating may be resumed.

Worried mothers and mentally depressed business men often complain of this symptom. In these cases the explanation may easily be found in the depressing effect of the mind upon the activity of the colon and the resulting stasis and putrefaction.

Belching is often an unpleasant symptom of which the constipated complain. Alvarez points out that there are three kinds of belching: A slight gurgling sensation felt in the esophagus, the eructation of gas from the stomach and a movement of air downward into the stomach or a voluntary or semi-voluntary swallowing of air. Careful observations have clearly demonstrated that so-called belching is in the majority of cases simply the swallowing of air or the eructation of air that has been swallowed.

It should be remembered, however, that this is not simply a vicious habit voluntarily acquired, but an effort on the part of the patient to relieve a feeling of discomfort experienced in the stomach. The condition seems to be similar to that which sometimes gives rise to hiccough. Not infrequently hiccough and belching are associated.

It is probable that in many cases the gastric discomfort is the result of a reverse peristalsis which brings gas or liquid into the stomach. Swallowing of air opens the upper orifice of the stomach, permits some of the gastric gas to escape and thus affords momentary relief. It is

well known that gas is rarely generated in the stomach by fermentation. Gas in the stomach is either swallowed or brought up from the intestine by reverse peristalsis.

Instead of seeking relief by the swallowing of air, persons suffering from this inconvenience may obtain relief by sipping a glassful of very hot water, perhaps with the addition of a little lactose. This will open the upper orifice of the stomach and allow the escape of disturbing liquids or gas; also, it will permit the reverse waves to run out, as Alvarez suggests, and thus bring relief.

At the same time, the real cause of the trouble must be sought out and removed. In many cases there will be found not only a colitis and a spastic colon, but also a chronic duodenitis, a condition that is no doubt the real cause of most of the symptoms commonly attributed to disorders of the stomach.

Vertigo is a common symptom in cases of arteriosclerosis caused by constipation and the absorption of poisons generated by a putrefactive flora, and sometimes resulting from irritation produced by the presence of feces in the rectum.

In certain nervous persons, vertigo, faintness or exhaustion are experienced when the bowels are evacuated by a saline laxative or by an enema. The cause of this is doubtless the absorption of poisons brought into solution by the large

amount of fluid injected into the intestine. So long as the feces are hard, little absorption can take place. In some instances, the prostration is such that recovery does not take place for several hours. These are probably cases in which the liver and kidneys are crippled as the result of long-standing disease. Doctor Case has observed that unpleasant symptoms immediately following an enema are connected with the entrance of the injected liquid into the small intestine through an incompetent ileocecal valve. This observation suggests that vertigo at other times may be due to refluxed material from the colon, due to its anti-peristaltic action.

Lack of Appetite and Thirst

Aversion to food may be the result of many different causes, both mental and physical. There is, however, good reason for believing that in many cases, perhaps the majority of cases, the lack of appetite is but a mild manifestation of an interruption of the normal progress of food or food residues along the intestinal tract and the absorption of poisons generated by a putrefactive flora. Cannon demonstrated that when obstruction occurs in any portion of the bowel, there is delay in the higher lying parts. It has often been noted that the stomach ceases to pass its contents into the intestine when the intestine is overfilled lower down.

A colon overfilled with residues thus becomes a cause of gastric disturbance. The emptying of the stomach is slowed, and the hindrance may be so great as to produce not simply a lack of inclination to the taking of food but a complete aversion to food of any sort.

Lack of desire for food, while a common result of constipation, may be due to lack of exercise, excessive heat, insufficient vitamin B in the food, etc. With loss of appetite there is absence of relish for food, and hence a failure of the meal to awaken those lively peristaltic movements that are essential to propel forward in the colon the hardening masses of fecal matter that are stored up in its lower segments waiting to be discharged. Those who eat without appetite are always constipated. While the lack of relish for the food encourages the constipation, the latter still further lessens the appetite, and so the difficulty becomes more and more aggravated.

Not infrequently the thirst center as well as the hunger center appears to be paralyzed by the poisons absorbed from the colon, causing aversion to water as well as to food. Such persons drink far too little. As a result the urine is scanty and concentrated, and it irritates and damages the kidneys. When the body wastes together with the toxins absorbed from the colon are imperfectly eliminated, every organ in the body suffers.

Coated Tongue and Foul Breath

The coating of the tongue, which is known to be due to a growth of bacteria, is doubtless the result, in part, of a general lowering of vital resistance, with consequent depreciation of the germicidal properties of the blood serum and the consequent loss of the power of the saliva to prevent the growth.

It appears, however, from the experiments of Grützner and others that this growth of bacteria on the tongue may in some cases be the result of direct infection. Grützner showed that bacteria and lycopodium introduced into the rectum in dogs were within a few hours carried to the mouth. Hundreds of bacteriological examinations of the saliva made in the laboratory of the Battle Creek Sanitarium have shown, in a very large percentage of the cases, colon bacilli present in the mouth in great numbers.

Since it is well known that the bile frequently enters the stomach during sleep, and since it is also known that colon bacilli are frequently found in the bile, it will readily be seen that these pernicious organisms may easily find their way by regurgitation to the mouth. If the saliva has lost its normal power to inhibit the growth of these organisms, the natural result will be the densely coated tongue and foul-smelling breath that are found in persons suffering from the condition commonly known as "biliousness."

These common conditions are more often due

to constipation than to neglect of the mouth. Of course the toilet of the mouth and "mouth treatment" by a skillful dental surgeon must not be neglected, but the cure is not to be found solely in dentifrices, lotions, tooth brushes or dental procedures. It is necessary in many cases to remove the causes, which often are a toxic diet, constipation—either apparent or latent—and a bad flora. When these conditions are corrected, the tongue clears and the breath sweetens.

Herter lays emphasis upon the thorough cleansing of the teeth so as to avoid infection of the food with the putrefactive bacteria, which develop in the mouth when the teeth are not well cleansed.

The normal stomach is sterile during digestion, because the gastric juice is a powerful germicide, but in stomachs that do not produce a sufficient amount of gastric juice and in normal stomachs when empty of food, great numbers of dangerous microbes may be found.

A high protein diet, that is, the free use of eggs and meats, together with constipation even in very mild degree, will cause coating of the tongue and a fecal odor of the breath.

Flatulency

This symptom may result either from the excessive formation of gas in the intestine, or from the accumulation of air through swallowing.

Flatulence may become dangerous in cases of high blood pressure with degeneration of the blood vessels. The great accumulation of gas in the intestines forces the blood out of the abdominal vessels into the general circulation, and so raises the blood pressure. If the blood pressure is already high, and the blood vessels are much diseased, the rise of pressure may be sufficient to cause the rupture of a vessel and apoplexy with paralysis, if the rupture occurs in the brain.

Incompetency of the ileocecal valve interferes with the movement of gases even more than with that of liquid material. Liquid as well as solid material may be moved along in the large intestine even though the lumen of the gut is not completely closed during a contraction. Peristalsis in the colon differs from peristalsis in the small intestine. In the colon, contraction rings traverse the whole gut in such a way as to produce a positive forward movement of the entire contents, both liquid and gaseous. Shortening and mass contraction is made possible by the fixation of the gut at the hepatic flexure (Max Hurst). With a closed ileocecal valve, the contents of the cecum and ascending colon must move forward when the capacity of the gut is lessened by contraction.

But when the valve is incompetent, although the forward movement of both liquid and solid material is still possible, it is retarded, and the

intestinal gases are controlled scarcely at all. As the large intestine contracts, the gases rush back through the open ileocecal valve, distending the small intestine. Thus they oscillate back and forth between the large and small intestine, making little or no forward movement. It is on this account that patients in whom the ileocecal valve is wholly incompetent are usually subject to a most distressing accumulation of gas in the intestine. The abdomen is greatly distended, and while small quantities of gas escape from time to time by mouth and anus, complete relief is never obtained. This form of flatulence, which is quite characteristic of complete incompetency of the ileocecal valve, was found in 35 per cent of 60 cases studied.

The formation of gas in excess is due primarily not to the excessive use of starchy food, as many persons suppose, but to the use of food that supplies nutriment to a putrefactive, gas-forming flora, and to the stagnation of the residues of such food in a crippled colon. Bouchard showed long ago that if the foodstuffs remain overlong in any one part of the alimentary canal, even in the stomach, bacterial changes are set up.

Flatulence is an evidence, then, of the presence of pernicious bacteria; that is, a bad intestinal flora. Welch's bacillus, the so-called gas bacillus, is the great gas producer.

When Lacto-Dextrin and B-Lac are given to

change the intestinal flora, not infrequently there is an immediate increase in gas production. This indicates that the remedy has reached the colon and that the change of intestinal flora has begun. By a persevering use of these natural foods for the aciduric flora, the pernicious organisms will be driven out and within three or four days the amount of gas will be diminished. When the flora is changed, the gas will disappear altogether. This demonstrates that carbohydrates are not the real cause of flatulence. The right carbohydrates are, in fact, the one efficient means of curing the condition.

Persons who have been accustomed to a hearty meat diet sometimes suffer considerably from flatulence when a change is made from meat to vegetables, but this should not be considered as a need to return to a highly nitrogenous diet. After a short time, if the activity of the bowels is increased to such a degree that the constipation is overcome, and if the flora is changed, the flatulence will disappear.

Headache

Headache, sometimes accompanied by vertigo and a sensation of exhaustion and depression, is a symptom commonly experienced by persons suffering from constipation. These symptoms may be the result of reflex action, or they may be in whole or in part the result of chronic poisoning due to the absorption of long-

retained fecal matters. The fact that the symptoms disappear almost immediately when the bowel is emptied by an enema does not necessarily indicate that the act is wholly reflex. Effects due to autointoxication are the result of over-saturation of the blood with poisons derived from the bowel contents. When, by removal of the source of the poisons, the intake ceases, the liver and kidneys quickly clear the blood of the subtle intoxicants, and the nerve disturbance ceases.

Attacks of migraine are usually preceded by an increase of stasis, that is by an accumulation of fecal matters that throws into the blood a new flood of indican and other toxins. By a thorough emptying of the colon through the use of the enema, the attack may always be mitigated and sometimes averted. If the attack has actually begun, however, the result is less satisfactory, although even then the duration of the attack, if not its intensity, may be lessened by cleansing the colon with repeated enemas.

When vomiting or nausea is present, the enema may be repeated several times a day as a means of introducing much needed fluid. An excellent plan is to introduce into the colon, to be retained and absorbed, half a pint to a pint of water two or three times a day.

The excruciating pain of migraine may be made more endurable by fomentations or alternate hot and cold applications.

The use of morphia and other narcotic or pain-relieving drugs is most pernicious. The use of drugs merely secures present relief at the expense of increased future suffering. Such drugs increase the constipation and so aggravate the toxemia, and not infrequently a drug habit is formed.

As the stools become less putrid and as the tongue clears and the malodor of the breath disappears, headaches lessen in frequency and severity. By a persevering effort a permanent cure may be accomplished.

Insomnia

One very rarely finds a person suffering from insomnia who is not constipated. Not infrequently the constipation is present in the latent form, and its existence may not be suspected. Examination of the flora, of the toxins present in the urine, and of the condition of the tongue and breath, usually elicits clear evidence of the cause.

Such cases of insomnia are apparently due to the irritation of the brain cells produced by the poisons with which the blood is saturated.

The use of soporifics secures only temporary relief, with a certainty of making the patient worse through disturbing his digestion, destroying his appetite, and thus making his constipation worse. By relief of constipation through proper diet and the adoption of other rational

measures, the insomnia may be made to disappear, and usually with very great promptness.

Insomnia may be not only a result of constipation but a cause or aggravation of this condition, through spasm of the descending colon.

A hot enema at bedtime (2 quarts at 110°-115° F.) is a very successful means of combating insomnia associated with constipation.

The neutral bath renders great assistance in overcoming insomnia. It is simply a warm bath (92 to 96° F.) taken just before retiring. The length of the bath may be 15 minutes to one hour or even two hours—whatever time may be necessary to induce sleep.

Backache

Aside from symptoms that relate to the rectum, backache is perhaps the most common of all local symptoms arising from constipation and a putrefactive flora.

In women this symptom is usually attributed to disease of the womb or ovaries. As constipation is so constantly associated with disease of the pelvic organs, it is a question of interest whether or not the pain usually attributed to pelvic disease in many instances is due to disease of the colon or rectum.

In many cases tender points can be felt by deep pressure along the descending colon. By the aid of the X-ray and the fluoroscope, it is possible to locate and make pressure upon every

part of the colon, to note its form and size and thus to detect the presence of disease. Tender spots in the lower part of the back are usually due to the same cause, and only rarely indicate disease of the spine.

The congestion of the abdominal organs that results from chronic constipation is the cause of a great variety of reflex pains in the back and sides. Coldness, numbness, prickling and tingling sensations, points of tenderness in the abdomen, a sense of weight, dragging and pressure—these are only a few of the distressing symptoms that arise from visceral congestion due to the absorption of toxins from the intestinal tract, and the infection of the intestinal mucous membrane resulting from chronic constipation.

An obstinate and very distressing pain in the back is a reflex symptom sometimes associated with a spastic condition of the descending colon. The pain is often promptly relieved by hot irrigation of the colon, causing the contracted intestine to relax. In such cases the application of a hot fomentation over the seat of pain will often render very great service. A hot sitz bath may be equally useful. A hot water bag placed against the abdomen will be found effective in lessening pain and as a mechanical aid to defecation.

Fecal Fever

A rise in temperature, due to an accumulation of feces in the colon, may so resemble ma-

larial paroxysms that it is treated by administering quinin. There is very often a distinct chill, followed by fever and sweating. The tongue is coated, the breath bad, and there is much headache and sometimes vomiting. The fever may last several days, but disappears quickly when the bowels have been thoroughly evacuated.

These attacks are very common in persons who are subject to colitis, and much mucus is often discharged when the bowels are cleared out.

Neglect to secure complete and regular evacuation of the bowels is a frequent cause of rise of temperature after confinement and in convalescence from acute illness. Accumulation of feces not infrequently occurs when the bowels move daily, and even when the bowels are quite loose, as shown by the immense quantities of loathsome material that may be washed out by means of a thorough enema. The writer recalls a case in which a woman who had very loose movements for two or three weeks was found to have an enormous mass of hardened fecal matter in the rectum and a very great accumulation of feces in the lower colon.

Bed patients should always be made to sit up when moving the bowels or urinating, when this is at all possible, so as to secure complete evacuation of the urine and feces.

The same remark applies with special inter-

est to cases of confinement. There is so often an accumulation of feces in the colon in pregnancy, especially within the last two or three weeks before confinement, that it is highly important to give the matter prompt attention at once after the child is born, as well as before confinement. Very often a great quantity of putrefying material will be removed, the retention of which would give rise to autointoxication with fever and even worse symptoms. When possible, the lying-in woman should have the flora changed at least a week or two before the confinement. When this is done, the risk of grave complications is greatly lessened.

CONSTIPATION AND CHRONIC DISEASE

Several years ago the subject of alimentary toxemia was discussed in London by the Royal Society of Medicine, fifty-seven of the leading physicians of Great Britain participating. Among the speakers were eminent surgeons, physicians and specialists in the various branches of medicine. Such an array of evidence was presented, backed up by the authority of many hundreds of other English, German and French physicians, that it is no longer possible to ignore the importance of alimentary toxemia or autointoxication as a factor in the production of disease. It is constantly becoming more and more evident that the colon filled with putrefying food residues is a veritable Pandora's box of chronic maladies.

Since the publication of Bouchard's illuminating volume, in which he pointed out that the dangerous elements in body residues may be absorbed and carried to every tissue in the body, progressive physicians, both surgeons and internists, have shown a steadily increasing disposition to recognize in the colon, the body's receptacle for its germ-ridden residues, if not the specific source of a great number of human ailments, both physical and mental, at least a ma-

lign influence upon the body, and a heavy handicap to the *vis medicatrix naturae*, in the struggle of the body against the various causes of disease.

Clinical experience has demonstrated that the correction of no other physical disability is so far-reaching in its health benefits.

Lord Dawson of Penn, physician to the King of Great Britain, also physician at the London Hospital, said, "Although the terms 'alimentary toxemia' and 'intestinal stasis' are open to criticism, they convey to our minds a definite clinical picture. The sallow, dirty complexion, the inelastic skin, the dusky lips and nails, the dirty tongue, evil-smelling breath, constant abdominal discomfort of one kind and another, doughy, inelastic abdomen, cold extremities, the physical and mental depression, are among the prominent features. That such a condition may be produced by colon block and stasis, is, I think, clear."

Sir Arthur Keith, the great English anatomist, stated, "If an engine runs unsatisfactorily it may not be from a fault in its mechanism, but from a defect in the fuel. Those who regard the great bowel as a useless structure blame the engine. For my part I stand by those who blame the fuel."

Damage to the Heart and Blood Vessels

Palpitation of the heart is a common consequence of an acute accumulation of feces in the

colon, probably the result of the excessive absorption of toxins to which such accumulations give rise.

Pseudo-angina pectoris, in which the patient suffers pains in the region of the heart entirely similar to those that occur in angina pectoris, is frequently associated with the same condition, which may be regarded as one of the causes of true angina pectoris as well as of pseudo-angina.

Arteriosclerosis affecting the vessels of the heart has been clearly shown by Bouchard and other authorities to be one of the common results of chronic constipation. Years ago Boix of Paris showed that the poisons produced by the colon bacillus are capable of producing these degenerative changes which result in sclerosis of the arteries of the liver, spleen and other glands.

Dr. W. E. Dickson, Professor of Materia Medica in King's College, London, enumerated among other highly poisonous substances produced in the colon by the putrefaction of food residues, ammonia, which causes hardening and degeneration of the liver; tyramin, a very highly poisonous product; indol, skatol and cholin; sepsin (of which a small dose killed a large dog), a ptomain which is always found in the colon of meat-eaters, and which is decomposed into pressure-raising poisons (Barger and Walpole).

Dr. Langdon Brown of St. Bartholomew's Hospital, London, attributed the rise of blood

pressure in later life to colon poisons, which as he observed, "do not give rise to antibodies," so that, "the only way to secure immunity is to create a normal intestinal flora."

Doctor Beezly Thorne of Grace Hospital held that "the great majority of cardiovascular troubles are associated with an alimentary toxemia."

Doctor Boltentuit of Plombieres was said to have noted that "practically all subjects of long-standing colitis present myocardial weakness, generally with dilatation."

Harvey showed that parahydroxyphenylethylamin and iso-amylamin, poisons found in the infected colon, when given in small doses by mouth to animals during long periods, caused marked arteriosclerosis and large white kidney. Intestinal poisons were also shown to cause nephritis and fatty degeneration of the heart.

Mellanby claimed that an intestinal poison which lowers blood pressure, beta-imidazolylethylamin, is often present in large amount in putrescent stools, but "is never produced in the presence of carbohydrates and acids."

Dr. Alfred C. Jordan, the eminent roentgenologist of Guy's Hospital, mentioned as an example "of the havoc wrought on the tissues by intestinal poisons" that he had often found atheroma of the aorta at an unusually early stage in subjects of intestinal stasis.

Brieger and other investigators discovered a

great number of toxins in the colon, some possessed of a high degree of virulence. Bertrand and Dratschinski showed that the paracresol and phenol, as well as indol, found in the stools of mixed feeders, when given in small doses daily to rabbits, guinea pigs and monkeys, produced marked changes in the blood vessels in one to four months, together with degenerative changes in the liver and kidneys.

Barger and Walpole demonstrated the presence in the stools of pressure-raising poisons, and Bain found pressure-raising poisons present in the blood of persons suffering from high blood pressure.

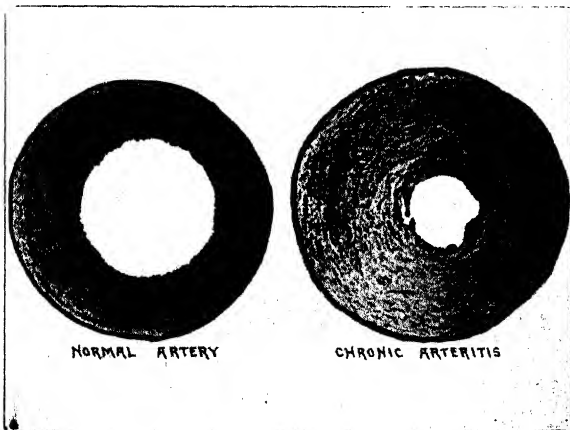
The straining at stool necessitated by constipation is a constant menace to damaged vital structures. In arteriosclerosis or degeneration of the blood vessels, especially among aged persons, straining at stool may cause rupture of a blood vessel and sudden death. In angina pectoris a spasm may result from straining at stool, sudden death having been known to occur in cases in which the heart was very feeble. The same should be said with reference to cases of myocarditis. Most smokers over forty have reason for observing this caution.

Mental Disease

For some years experts in mental disease, both in this country and in Europe, have maintained that certain forms of mental disease, par-



Diseased Arteries



Sectional View of Arteries Showing Effects of
Arteriosclerosis

ticularly dementia præcox and manic-depressive insanity, are in some cases induced by the functional disturbances or structural degenerations set up by toxins derived from focal infections, the seat of which may be the tonsils, the teeth, the genital organs or even the gall-bladder or the appendix, but which is most frequently the intestinal tract.

Dr. Lennox Wainwright of St. Michael's Medical Aid said at the meeting of the Royal Society of Medicine, "I am quite sure of this, that the mental effect on many patients of prolonged intestinal toxemia is such as to make them almost demented."

Dr. J. F. Briscoe, head of a large hospital for the insane, remarked, "Who has not seen a prodigious evacuation of the bowels at the hands of a physician terminate a case of insanity?" Adding, "It is obvious that constipation . . . on the mental side encourages and accentuates such symptoms as apathy, irritability, perverted moral feelings, melancholia, mania—even suicide; while on the bodily side it produces very marked emaciation, rheumatism, cachexia and a long string of diseases."

The fatigue observed by Sir Lauder Brunton resulting from colon poisons readily accounts for the depression, mental confusion, mental dullness and moral perversion that is observed in some cases.

A. Schmidt, the leading European authority

on gastric and intestinal disorders, describes the effects of chronic autointoxication as follows:

“Most of the symptoms that clearly result from the effects of intestinal decomposition are displayed by the nervous system. They are of the most varied kind. At one end of the series there is simple headache; at the other coma, convulsions and collapse. The more usual forms may be considered under the headings: (a) The general phenomena observed in cases of severe constipation; (b) epilepsy or eclampsia; and (c) psychoses. The general phenomena observed in cases of severe constipation include the nervous symptoms seen in chronic habitual constipation—feelings of being out of sorts, lassitude, headache, giddiness, neuralgia, ill-humor and so on. Leube and others regard these as due to mechanical reflexes. Müller and Nothnagel believe them to be signs of neuropathic diathesis, aggravated by digestive disturbance. The adherents of the autointoxication doctrine (Bouchard, Senator, Albu) attribute them to increased intestinal decomposition.”

It must be remembered that the colon is a source of a great variety of poisons, each producing its own specific effects, so that the large number of symptoms observed in the various forms of acute and chronic mental disease may easily be accounted for.

Cotton and others have insisted upon the great importance of the colon as a factor in

mental disease. These authorities cite cases in which removal of the colon or a large part of it has resulted in restoration of the patient to mental soundness when other means had failed.

The writer is of the opinion that in these cases a change of the intestinal flora by the methods pointed out, and careful attention to colon hygiene, would have accomplished the same results. The colon itself is not the offender. The source of the trouble is the contents of the colon. Stasis is of course a factor, but when putrefaction is suppressed by changing the flora, the colon contents are no longer toxic, and therefore stasis, even reflux, is a matter of less moment. In fact, a thorough-going change of the intestinal flora greatly aids in restoring normal colon activity.

Cotton and his colleagues have in recent years adopted the views here expressed, and at present are employing the methods recommended in this work—the cure of constipation and a change of intestinal flora—and with better results than were obtained by the surgical methods formerly employed. Sir Arbuthnot Lane, the eminent London surgeon, has made a similar change, now heartily endorsing the measures that the writer has long advocated.

Remarkable results have been obtained in certain cases of rheumatism and of epilepsy by daily irrigation of the colon for some months through a permanent opening into the cecum

established by means of a cecostomy or an appendicostomy. Equally good or even better results are often attainable without surgery, by thorough daily irrigation of the colon, with change of the intestinal flora and adherence to an antitoxic diet.

Disease of the Kidneys

Bacteriological examination of the urine in cases of suppuration of the kidney often shows the presence of colon germs. A putrefactive and pathogenic flora, especially when its virulence is increased by stasis or stagnation, readily penetrates the walls of the intestine and adjacent organs. The right kidney lies in immediate proximity to the colon.

Bright's disease is increasing very rapidly according to the statistics of all civilized countries. At the present time the mortality rate in the United States from this disease is more than double that of thirty years ago. In certain cities the proportion is still higher, the increased mortality rate from this cause amounting to 164 per cent.

It is quite possible that chronic constipation may be one of the most important of all the causes of this terrible malady.

The poisoning resulting from putrefaction is frequently indicated by the appearance of albumin and casts in the urine. A long continuance of this poisoning gives rise to changes in

the kidney, which are commonly known as "Bright's disease."

Disorders of the Genito-Urinary Tract

Urinary troubles in both men and women, as well as in children, are often traceable to constipation. Very foul-smelling urine often owes its unnatural odor to the presence of putrefactive poisons absorbed from the intestine.

Both inability to urinate and a frequent desire to urinate may result from the accumulation of feces in the rectum.

In children the escape of urine during sleep is often due to constipation.

Disorders of the genito-urinary tract, as also of the mammary glands, were mentioned by several speakers in the discussion of autointoxication by the Royal Society of Medicine of Great Britain. Among the conditions named were various displacements, distortions and diseases of the uterus, metritis and endometritis; infection of the bladder, especially in women; frequent urination; albumosuria; acute nephritis, movable kidney; floating kidney; also fibrosis of the breast; wasting of the breast; induration of the breast; sub-acute and chronic mastitis and cancer. Doctor Lane says: "Autointoxication plays so large a part in the development of diseases of the female genito-urinary apparatus, that they may be regarded by the gynecologist as a product of intestinal stasis."

From the above facts, it becomes evident that it is irrational to treat the local condition alone. By change of the intestinal flora, and thus curing the existing infections of the colon and the rectum, the infections of the urinary tract as well as disturbances elsewhere may often be made to disappear spontaneously. Cases of this sort require the services of a skilled specialist.

Damage to the Liver and Spleen

Marked enlargement of the liver and spleen is frequently associated with chronic constipation and intestinal autointoxication. The constant flooding of the liver with toxins must result in damage to its tissues. Boix showed this in his experiments upon rabbits.

Some years ago the writer, when removing a gall-bladder, encountered a liver that had all of the characteristics of a "gin liver," although there had never been any use of alcohol. Constipation, however, had existed for many years. This patient, notwithstanding the badly crippled condition of her liver, has, since the operation, now several years, enjoyed excellent health by close adherence to an anti-toxic diet, by the use of psyllium seed to keep the colon clean, and by the aid of Lacto-Dextrin to maintain an acid-uric flora.

Recent observations made by a French physiologist indicate that by the free and prolonged use of carbohydrate, a damaged liver may be

aided to repair its injured cells and recover its efficiency. This fact is of the greatest interest, as it offers the hope that by the same means as those required to change the intestinal flora (involving the use of lactose, the sugar of milk) the damaged and crippled liver may be repaired and thus premature senility postponed.

Disease of the Thyroid Gland

Enlargement and over-activity of the thyroid gland, a serious disorder that is seemingly becoming increasingly common, may be induced by an excessive amount of work demanded of the gland because of the absorption of the poisons of high protein and of putrefaction from the intestinal tract.

The pernicious effects of colonic poisons upon the thyroid is clearly shown in an observation made by McCarrison, who demonstrated by experiments on goats that congenital goiter may be caused by the absorption of fecal matters from the intestine of the mother. Fecal contamination may possibly be a source of congenital goiter in human beings as well as in goats. Absorption of putrefactive products from the intestine overtaxes the capacity of the thyroid of the fetus, leading to compensatory overgrowth. The inference is a fair one that thyroid disease in adults may arise from the same cause.

First Combe and Ewald, and later others, called attention to the beneficial effects secured

by withdrawing meats of all kinds from the diet of persons suffering from disease of the thyroid gland. The practice of eliminating meat from the diet in cases of this sort is well supported by Breisacher's experiment, by which it was proved that dogs whose thyroid glands had been removed do very well on a diet of bread and milk although they develop convulsions and die within a few weeks when given meat.

It has long been known that rabbits tolerate removal of the thyroid gland so well that in many cases they appear to be almost uninjured by the operation, doubtless because of the small amount of putrefactive products in their intestines.

To treat the thyroid simply by the surgical removal of a part of the gland or by partial destruction of the gland by the X-ray, without giving attention to the cause of the disease, is certainly irrational. The writer has seen numerous cases of hyperthyroidism, or exophthalmic goiter, make excellent recoveries without operation by the use of rest, natural or artificial sunlight baths, cold air baths, various tonic hydriatic measures, carefully graduated exercises, a strict anti-toxic diet and change of the intestinal flora. These measures are preventive as well as curative, as they combat the causes of the patient's condition and increase his vital resistance.

Doctor Crile, the eminent surgeon of Cleveland, whose experience with thyroid cases is ex-

tensive, has for several years been calling attention to the importance of requiring patients to abstain from the use of meat for several months after an operation on the thyroid. When asked by the writer, "Why not ask the patient to abstain from the use of meat permanently?" he replied, "Of course that would be better still."

Myxedema

Myxedema, a condition in which the thyroid is deficient in activity, is also possibly induced, in some cases, by the excessive work imposed upon the gland by chronic intestinal toxemia. The writer has seen very great amelioration of this condition result from the suppression of intestinal toxins.

The common practice of relying wholly upon the use of dried thyroid, or thyroid extract, in cases of myxedema, is greatly to be deplored. When such a method is followed, the causes that have produced degeneration of the thyroid continue active. Their influence is in no way lessened by the use of thyroid extracts, a purely symptomatic mode of treatment.

It is important not to overlook the fact, also, that the same causes that give rise to degenerative changes in the thyroid are doing damage to other important parts of the vital machinery, although those injuries may not yet be so great as to attract attention through specific symptoms.

In every case of myxedema, the flora should be changed and an aciduric flora maintained by the free use of Lacto-Dextrin and lactose in other forms. Meats of all kinds should be discontinued from the dietary altogether, as well as other toxic foods of every sort. The colon must be kept clear of decomposing residues.

Diabetes

Diabetics nearly always give a history of chronic constipation or intestinal stasis. Mason Good, in his remarkable work, "Study of Medicine," made note of the fact more than a hundred years ago that constipation is a constant accompaniment of diabetes. Some years ago Dr. James T. Case at the Battle Creek Sanitarium, made an X-ray study of thirty successive cases of diabetes, to each of which was given a barium meal. Marked intestinal stasis was found in every case but two, and incompetency of the ileocecal valve was present in nearly all cases.

Infections of the intestine lead to infections of the gall-bladder and of the pancreas, and may thus induce diabetes. Modern observations point clearly to the fact that changes in the Islands of Langerhans are responsible for the failure of the pancreas to produce insulin. Evidence is accumulating that a cause of these changes may be found either in infections of the glands by bacteria from the intestine or in

injury resulting from products of putrefaction absorbed from the intestine. Klotz some years ago called attention to the relation between intestinal disturbances and diabetes. Funk and others have secured remarkable results in a number of diabetic patients by the correction of their intestinal disorders.

The intensive study of the relation of diet to blood sugar and to the sugar of the urine, made by numerous able observers within the last few years, has appeared to lead to the practically unanimous conclusion that a high protein diet, that is, a meat diet, is not desirable in diabetes. Few specialists in the treatment of this disease suggest a higher protein ration than one gram of protein per kilogram of body weight, which would be less than two calories per pound, whereas Newburgh and others have reduced the ration still further, to two-thirds of a gram per kilogram, or one and one-third calories per pound of body weight. This is a moderate amount of protein, but even this amount, when including meat, will leave in the colon residues of such a character that they will tend strongly to encourage the growth of bacteria of the putrefactive type. The stools of meat-fed diabetics are always highly putrid.

Klemperer also believed that "meat is injurious because it favors a proteolytic flora. Purely vegetable feeding gives rise to a fermentative flora." This able observer thus showed the

essential importance of maintaining a non-putrefactive flora in diabetics. Says Allen, "It is thus possible to understand the generally beneficial effects of any purely vegetable diet."

Pernicious Anemia

A disease that is becoming constantly more prevalent in civilized countries, pernicious anemia, and that in its advanced stages offers no hope for recovery, is believed by many clinicians to find its origin in intestinal infection due primarily to constipation. The putrefaction of food residues in the colon affords a favorable opportunity for the development of pernicious organisms, which give rise to colitis. As the resistance of the intestinal mucous membrane is broken down by the destruction of its protective epithelial covering, the bacteria and their poisons escape into the blood, and in time break down the resistance of the blood and the tissue fluids. This lowered resistance is manifested in pyorrhea, decay of the teeth, degeneration of the liver and kidneys and also of the glands of the stomach, thus leading to achylia, a condition in which hydrochloric acid is absent from the stomach, often a forerunner of anemia.

Also, through incompetency of the ileocecal valve, which always exists in cases of pernicious anemia, there is an ascending infection from the colon upward. Faber has recently called attention to the fact that in pernicious anemia a

colonic type of flora is often found in the duodenum, and that toxins are formed in the intestine that cause destruction of the blood when injected into animals.

The blood-making organs finally degenerate, producing changes in the blood characteristic of pernicious anemia. Lastly, degeneration of the spinal cord develops and paralysis makes its appearance, sometimes accompanied by mental indications of degeneration of the brain.

Herter many years ago called attention to the fact that the stools are highly putrefactive in cases of pernicious anemia. He observed that carnivorous animals are much more liable than are herbivorous to develop pernicious anemia, especially in the later years of their lives. According to his investigations, "It is usual in the later years of life for meat-eating animals to show a much diminished volume of blood and at least a moderate fall in the hemoglobin. Instances are stated to be not uncommon in which a pernicious type of anemia has developed in the carnivora. On the contrary, among the herbivora it is said that pronounced anemias are very rare."

Dr. Frederick Langmead attributed thyroid disease, as well as some forms of pernicious anemia, to intestinal toxemia, as did Dr. William Hunter many years ago.

Recent experience has shown that remarkable improvement in cases of pernicious anemia,

follows the use of an extract of liver. The earlier practice of eating liver is strongly to be condemned because it produces injury to the kidneys. Liver feeding causes nephritis in rats within a short period, and early death (Newburgh).

It is evident that the liver produces a hormone that is essential for the normal functioning of the blood-making processes of the body, and doubtless for other vital processes as well. When the liver becomes worn out by the overwhelming tasks imposed upon it through the absorption of putrefactive poisons from a neglected colon, it is no longer able to produce the needed hormone, and the general vital collapse found in pernicious anemia is a natural result.

In the treatment of this disease, it is of the utmost importance not only to administer the liver extract but to suppress, as far as possible, the malign agencies by which the efficiency of the liver has been broken down and the whole organism damaged. This requires the constant maintenance of an aciduric flora and the complete suppression of intestinal putrefaction, by the means elsewhere set forth in this volume.

The absence from the stomach of free hydrochloric acid in cases of pernicious anemia, renders it necessary to make regular use of this acid as a food accessory and as an efficient means of combating the infections of the stomach and

the upper part of the small intestine. The hydrochloric acid is best taken in the form of tablets, and in such combination that the acid is set free gradually during the digestive process.

If the measures above suggested, namely, the maintenance of an aciduric flora and the systematic use of hydrochloric acid, were adopted in all cases of achylia, it is more than probable that the number of cases of pernicious anemia would be very notably diminished.

Tuberculosis and Cancer of the Colon

Intestinal tuberculosis appears to be increasing. That this should be the case is not surprising, in view of the fact that constipation is becoming more and more prevalent each year. The contact of poisonous fecal matters with the mucous membrane lowers its resistance. All forms of tuberculosis, as the history of cases shows, are almost invariably preceded by chronic constipation for a prolonged period.

Rollier has shown the great value of sunlight and of a meatless diet in these cases. In a case recently observed by the writer, a young woman, suffering from abdominal tuberculosis, whose condition seemed altogether hopeless, was rapidly restored to health by change of the intestinal flora and a strict biologic dietary, combined with daily sun bathing.

The growing frequency of cancer of the colon may be cited as another of the results of

colonic infection. Colitis and ulceration are conditions that involve chronic irritation, a recognized cause of malignant disease.

Chronic Rheumatism—Osteo-Arthritis

Rheumatic disorders are closely associated with constipation and alimentary toxemia. Herter showed that certain putrefactive organisms are always present in great numbers in the stools of persons suffering from osteo-arthritis. The experience of many physicians has shown that great improvement in these cases often follows the adoption of a low protein and thus a less putrefactive diet.

It is the benefit derived from securing increased activity of the bowels that has made many a mineral spring famous as a cure-all for rheumatics.

Professor Mantle held that chronic rheumatism may be the result of the absorption of poisons from the colon. Dr. Douglas Wilson believed intestinal toxemia to be a cause of rheumatism and cut short many attacks of gout by thorough lavage of the colon. Doctor Mummery of St. Mark's Hospital attributed failure of the liver and kidneys, as well as many cases of arthritis, to intestinal toxemia. He said, "Some of the most interesting and important cases of autotoxemia are those in which there are associated joint lesions of the nature of a semi-acute or chronic arthritis. I believe that

many of the cases of crippling arthritis that we see from time to time are due to poisons formed in the large bowel."

While chronic rheumatism, rheumatic gout, and osteo-arthritis, are sometimes due to focal infections located in the mouth, there is little room for doubt that the greatest focus of infection in most of these cases is to be found in the colon. The mouth infections are probably in many cases secondary to colon conditions that have reduced the general resistance of the body. Certainly the proper use of sunlight and other physiological measures, change of flora, training of the bowels to normal activity and a non-toxic diet, are the measures that accomplish more relief of chronic rheumatism than any others, or in fact than all other measures combined.

Rachitis, Arrest of Growth and Other Nutritional Disturbances

The researches of Combe and Rouget have clearly shown the relation of intestinal intoxication to the arrested growth and other disturbances of nutrition which are frequently observed in infants and young children, and the fact that constipation lies at the foundation in most of these cases.

One of the most important of all the duties of a nurse is to attend carefully to the condition of the infant's bowels, as neglect in the first

weeks of infancy may lay the foundation of troubles that years of painstaking efforts will be required to relieve and that may be irreparable.

In recent years some eminent specialists in children's diseases, in their efforts to prevent the evils resulting from the use of castor oil and other laxatives, have gone to the extreme of advising parents to neglect the infant's bowels almost altogether. Mothers are sometimes advised that if the baby's bowels move every other day, or even once a week, there is no cause for concern. This is most pernicious advice. While it is true that a moderate degree of constipation is preferable to the colitis and other grave conditions that will result from the use of drug laxatives, it is also true that to impress upon an infant the constipation habit is to cripple its colon in a manner to cause lifelong suffering and inefficiency.

Infancy is the time for the formation of correct bowel habits. This is a matter to which savages give assiduous attention. Several times a day the mother, in a tribe of primitive people, will hold out her infant, in order to establish the habit of regular and frequent evacuation.

In the discussion of intestinal toxemia by the Royal Society of Medicine of Great Britain, various disorders of nutrition were ascribed to the absorption of intestinal poisons, besides degeneration of the organs of elimination, especially the liver, kidneys (Bright's disease) and

spleen; also pernicious anemia, lowered resistance to infection of all kinds, premature senile decay, retardation of growth in children accompanied by mental irritability and muscular fatigue, adenoids, enlarged tonsils, scurvy, enlarged thyroid (goiter), various tumors of the thyroid and Raynaud's disease.

Diverticulosis

Diverticulosis is a giving way of the wall of the intestine, generally at some point at which the strength of the wall is weakened by the entrance of a blood vessel. The fibers of the muscular coat of the bowel separate and a pouch of mucous membrane pushes its way through. The cause seems to be injury to the bowel set up by infection, perhaps by long-continued colitis and over-distention of the bowel with residues and gas.

Diverticulosis is found, according to Spriggs, in about one-tenth of all persons suffering from gastric and intestinal disorders. A person may have a large number of diverticula in his colon and be wholly unconscious of any inconvenience resulting therefrom.

Constipation is of course always present. It may not be so pronounced, however, as to cause great inconvenience; that is, the bowels may move regularly once daily, a condition that the average person considers a state of physical beatitude as far as the colon is concerned. Un-

fortunately, as pointed out by Hurst of London and numerous other X-ray experts, movement of the bowels once a day does not insure prompt evacuation of wastes and residues. In fact, when the bowels move only once in twenty-four hours, as already remarked, the time that elapses from the moment of taking food to the dismissal of the unusable residues along with other body wastes, is often fifty-three or fifty-four hours. This long retention of fecal residues affords an opportunity for putrefaction and fermentation with the production of poisons and the development of large quantities of gas, which distend the colon and which are without doubt a mechanical factor in producing diverticula.

Not infrequently, however, persons who have diverticula suffer from pain, especially in the left lower section of the abdomen. A hard mass can be felt in this region. Pain in the lower back after bowel movement is another common symptom. Sometimes attacks resembling mild onsets of appendicitis occur. The pain is on the left side, however, instead of the right side, a symptom that distinguishes this condition from acute appendicitis, although it is to be remembered that in rare cases the appendix is found upon the left instead of the right side of the body.

Every person experiencing such symptoms should submit himself to a very thoroughgoing



Diverticula (Case)

X-ray examination, and if diverticula are found to be present, exhaustive treatment by diet and other means should be applied at once. Such an X-ray examination should then be repeated once or twice a year, for the disease is naturally progressive unless energetic measures are applied thoroughly and continuously.

Special care must be taken in these cases to avoid the use of laxatives. They increase the local irritation and may give rise to an acute inflammation.

If obstruction occurs, an experienced surgeon should be called at once. Unless the symptoms are extremely urgent, however, a persistent effort should be made to secure relief by other means, such as fomentations, hot enemas, a strictly anti-toxic diet with change of flora and the use of all measures for curing constipation, before resorting to surgery.

The great danger in diverticulosis arises from the fact that in some cases the outlets of the diverticula are so small that the fecal matters that enter them do not escape but remain and undergo hardening, forming stercoroliths.

While massage is more or less useful in ordinary cases of constipation, this measure should never be employed in cases of diverticulosis because of the danger of doing mechanical injury, of causing perforation or of setting up an inflammatory reaction.

Skin Diseases

Among the skin symptoms associated with autointoxication noted by various experts of the Royal Society of Medicine of Great Britain may be mentioned the following:

Formation of wrinkles; thin, inelastic, starchy skin; pigmentation of the skin—yellow, brown, slate-black, blue; muddy complexion; offensive secretion from skin flexures; thickening of the skin on the back of the upper arm; irritability of the skin; sweating of the palms of the hands and the soles of the feet; eruptions of the skin—sores and boils; pemphigus; pruritis; herpes; eczema; dermatitis; lupus erythematosus; acne rosacea; cold, clammy extremities; dark circles under the eyes; seborrhea; psoriasis; pityriasis; alopecia; lichen planus; jaundice. It was also claimed that a very small amount of poison might result in skin eruption.

Doctor Adamson, head of the department of skin diseases of St. Bartholomew's Hospital, London, stated, "There are many skin eruptions—psoriasis, lichen planus, pemphigus, scleroderma, pityriasis rosea, alopecia areata, lupus erythematosus and others—which are certainly definite entities, and almost obviously due to some specific cause, of the nature of which, however, we are as yet ignorant. There are circumstances which have rendered it very improbable

that these eruptions are due to the local presence of microorganisms, and the only alternative seems to be to regard them as due to toxins. The most likely source of such toxins seems to be the alimentary canal.

"One thing that has been learned from the experimental work in regard to the erythemas and urticarias due to food poisons and drug poisons was the infinitesimal amount of poison that might suffice to cause an eruption."

Dr. W. Knowsley Sigley stated, "The treatment of a large number of general skin eruptions resolves itself into the scientific treatment of chronic constipation.

"It is not the frequency of the evacuation that is important, but the quantity, that is to say, that the contents of the large bowel be systematically completely removed, and that there be not an ever-increasing residue left behind. In other words, it is necessary to be sure that the patient is not passing today what he ought to have gotten rid of a week or perhaps a month ago."

Dr. James Galloway, senior physician of Charing Cross Hospital, held that intestinal toxemia is capable of producing nearly all forms of skin disease—among others, lupus erythematosus and dilatation of the vessels of the skin, also purpura and pigmentation of the skin.

Many skin eruptions, particularly psoriasis and eczema, rapidly disappear, in most cases in the

writer's experience, when the intestinal poisons are suppressed. Numerous cases might be cited in which a very chronic psoriasis has disappeared within a week or two after change of the intestinal flora, by the measures elsewhere explained, and by the exposure of the skin to the sun.

Danysz has presented a great amount of evidence in support of the view that many common cutaneous maladies are due to anaphylaxis, caused by bacterial poisons, developed in the intestine, to which poisons the body has been sensitized. The writer has encountered many cases in which the views of Danysz seemed to be confirmed both by the clinical findings and by the results of treatment. It should be said, however, that the real cure is to be found, not in vaccination, but in a thoroughgoing change of the intestinal flora.

The senile skin of many persons who have long suffered from chronic constipation and autointoxication, as well as the steady decline of longevity in countries in which constipation is prevalent, is evidence of the mischievous results of the constant absorption of the poisons produced by the colon germs that Metchnikoff regarded as the cause of old age. The pigmentation of the skin appearing first about the eyes and as brown spots upon the hands, the thinning of the skin of the hands and the parchment-like appearance of the skin, are familiar symptoms of senility.

It is highly important to note that these senile changes are not confined to the skin. The changes in the skin are only the external signs of similar degenerative changes taking place in the blood vessels, liver, kidneys and other vital internal parts.

Pigmentation is commonly seen in aged persons, in whom, as in others, it is induced by constipation. The same generally sallow skin is sometimes seen in young persons, and even in infants, as the result of intense poisoning from intestinal putrefaction.

When meat and eggs are eaten freely, according to Combe, there may be produced in the intestine a large amount of a brown poisonous coloring substance, *brenzcatechin*, to destroy which is one of the functions of the suprarenal capsules. When these glands become defective, through overwork, this substance accumulates and, being deposited in the skin, gives rise to dinginess of the complexion, brown circles around the eyes, so-called "liver patches" on the face and other parts, brown spots upon the hands, and a deepening of the color of parts of the skin that are normally pigmented, as the axillary regions, groins and in many patients a line down the center of the back.

When an anti-toxic diet is adopted, and the bowels are made to act normally, the pigmentation diminishes with remarkable quickness.

Pyorrhea

That constipation, resulting in autointoxication, is an active cause of loss of the teeth was suggested by Dr. Percy H. Howe of Boston, one of the professors in the famous Forsythe Institute, at a meeting of a state dental society. He proved this by actual experiments upon guinea pigs. He arranged their diet in such a way as to make them constipated, and in a short time pyorrhea developed in the mouth and the teeth became so loose that he could pick them out with his fingers. When this condition had developed but had not yet progressed too far, he made a change of diet so as to relieve the constipation, and this resulted in the disappearance of the unhealthy condition of the mouth. The teeth became solidly fixed in the jaw, and all symptoms of disease disappeared.

This extremely interesting observation agrees entirely with the views of the eminent English authorities who, in their remarkable symposium on intestinal toxemia, insisted that pyorrhea was the result of lowered vital resistance, resulting from intestinal toxemia rather than causing the condition, as some have imagined.

It has long been known, according to Ditmars, that snakes suffer from pyorrhea, which leads to necrosis of the bone and other infections and finally produces death. As a cause of this condition, Doctor Ditmars says: "I

think this is brought about by an enervated condition, robbing the blood of its germicidal qualities, during a period of disordered stomach. As the mouth of a snake that is not feeding becomes stored with stagnant salivary secretions, this region is attacked by the many kinds of bacteria that always exist in the mouth. A slight sore or bruise is generally the start of the trouble."

The cause assigned by Doctor Ditmars for the development of bad mouth conditions in the snake are the same as those to which the writer has for many years attributed teeth decay and other morbid infections of the mouth in human beings, namely, an enervated condition of the body or a state of low resistance, which robs the blood of its germicidal qualities and so renders the saliva, which is derived from the blood, incapable of protecting the mouth from the invasion of bacteria.

This is also the cause of the coated tongue, which is so universal among persons who suffer from constipation and autointoxication. A coated tongue is the mildest form of mouth infection, and it is a clear indicator of a state of the body in which the normal defenses are broken down, leaving an open door for the development of infections of various sorts, ranging all the way from decay of the teeth to pyorrhea, root abscesses, and even cancer.

The toothbrush is an essential aid to mouth cleanliness, but the only real protection for the

teeth is to be found in the maintenance of high bodily resistance by maintaining clean blood and body fluids. This is to be accomplished only by prompt disposal of the body wastes, which requires evacuation of the bowels after each meal, free water drinking, out-of-door life, and, in general, biologic living.

Eye Affections

W. Long, of the Royal Society of Medicine of Great Britain, says: "As an ophthalmic surgeon, I can look forward full of hope to a future when those serious eye affections will cease to occur because the physician has taught mothers how to feed children properly, and the dental surgeon has impressed upon the population at large the importance of proper mastication and of hygiene of the mouth."

Dr. Ernest Clarke found that the eye is highly sensitive to intestinal poisons, which often cause premature hardening of the lens and loss of accommodating power.

Doctor Colver of the Battle Creek Sanitarium, found, in a young woman of eighteen with failing eyesight, that the accommodation was reduced to that of a person of fifty years. By change of the intestinal flora, the eye symptoms were made to disappear within a few weeks and the accommodation to become normal.

Failure of eye accommodation is one of the first signs of senility. According to Warthin,

the accommodation is "the best index of physiologic age recognizable clinically." In the infant, the accommodation, as measured in diopters by the oculist, is 14. At twenty years the accommodation has dropped to 12. It is only 7 at thirty years, 4 at forty, 2 at fifty-one and 1 at sixty.

That there is a close relation between this senile change and the toxemia arising from constipation may be proved by abundance of clinical evidence. The following are illustrative cases, which might be multiplied many times:

A man of sixty-five, after correcting a chronic constipation and changing his intestinal flora and thus suppressing intestinal toxemia, found his glasses uncomfortable. On consulting his oculist, he discovered that his accommodation had improved, on account of the cessation of body poisoning, to such an extent that his glasses were fifteen years too strong for him. Those obtained by him at the age of forty-eight proved a perfect fit.

In another case, a college professor at the age of fifty-two found his accommodation improved to such a degree, by the same measures for combating intestinal toxemia, that he returned to the use of glasses fitted to him at the age of thirty-seven.

Experiences of this sort are common at the Battle Creek Sanitarium, where special attention is given to changing the intestinal flora.

Deafness

An eminent London ear specialist, Dr. Macleod Yearsley, has discovered that deafness in children is sometimes attributed to enlarged tonsils or some other cause when the real cause is to be found in the colon. Poisons absorbed from the intestine may injure the hearing by causing catarrhal disease of the middle ear or by setting up changes that affect the internal ear. From a large number of observations, he has reached the conclusion that "otosclerosis," a form of deafness that has puzzled otologists for two generations, is due to intestinal toxemia.

In support of his views, Doctor Yearsley cites from his practice cases of deafness in children that have made remarkable recoveries by correction of toxic conditions, after removal of tonsils and adenoids had failed. The doctor adds:

"But I have, during the past three years, found septic tonsils and carious teeth so often associated with chronic intestinal intoxication that I am forced to the conclusion that the latter is the primary septic focus and the first two merely secondary."

The writer has for years been convinced that disease of the teeth and tonsils are in many, perhaps nearly all, cases due to the lowered resistance resulting from chronic constipation and resulting toxemia. Many children become victims of colitis while still in their cradles.

Doctor Stucky, the famous nose, throat and ear specialist of Lexington, Kentucky, has for years advocated changing the intestinal flora as a most efficient means of combating disease of the ears and upper air passages.

Old Age

Wollman of the Pasteur Institute of Paris stated recently, in a paper presented at the Race Betterment Conference in Battle Creek, Michigan: "Sclerotic lesions are frequently found in intoxications, such as chronic alcoholism; also in certain types of infections, such as syphilis. In any case, there is a decided weakening of the natural cellular tissues by poisons or toxic microbes, following which the natural elements become the prey of these unnatural elements. Study of senile lesions, and of phenomena such as whitening hair, shows that it is a question of similar processes due to exaggerated activity of microbes.

"Guided by this analogy, Metchnikoff asked himself what could be the cause of weakening with age of the differentiated cellular tissues. The constancy of these sclerotic lesions permits the elimination of contingent factors, such as acute or chronic illness, and various known intoxications. It is evident that this process is formed within the organism itself. Metchnikoff localized it in the large intestine, the hotbed of fermentation and putrefaction. It would thus

appear that it is the toxic substances, produced by the microscopic flora, that are responsible for sclerosis and senile atrophy.

"During an important series of studies, Metchnikoff and his pupils established experimentally that giving small doses of the poisonous substances generated by the putrefactive flora (indol, paracresol) induced in animals sclerotic lesions, with marked changes in the brain tissues, arteries, liver, kidneys and suprarenal capsules, similar to those noted in old age."

Herter observed that the onset of senility may be distinctly accelerated through the development of intestinal infections in which the putrefactive anaerobes (flora) are prominently represented. He stated, "I have observed this in cases where it has appeared to me a certainty that other toxic causes of premature senility could be excluded. . . . It is probable that the 'wild races' of bacteria of which he (Metchnikoff) speaks as responsible for senile changes consist largely of putrefactive microorganisms. I am inclined to give prominence to *B. aerogenes capsulatus* (Welch's bacillus) as the most important factor in the production of the putrefactive decompositions of advanced age."

COMMON INFECTIONS DUE TO CONSTIPATION

Catarrhal Colitis

This common malady, by many considered incurable, is nothing more nor less than an infection of the colon. That the disease is curable has been proved in hundreds of cases. But there is only one successful method, viz., change of the intestinal flora. The pathogenic bacteria must be displaced by the normal protective flora. It does no good to destroy the pernicious bacteria with germicides, for they will be quickly reproduced. The germicide destroys the protective bacteria as well as the "wild" or "meat bacteria," and the old flora re-develops before the protective flora can get a start, on account of the absence of carbohydrates in the colon.

Various species of bacteria are capable of giving rise to colitis, according to Tissier. In general, it may be said that colitis is the result of the presence in the colon of excessive numbers of "wild" bacteria.

The chief seat of this disease is the lower colon, especially the pelvic and iliac. Sometimes, however, the effect extends to the entire colon.

The disease is essentially a chronic infection of the mucous membrane, and is the result of

injury done to the tissues by the prolonged contact with putrefying fecal matters, which in constipation accumulate and are often retained for days.

To understand the effect of these poisonous matters upon the mucous membrane, when acting continuously for days with constantly increasing virulence, it is only necessary to consider for a moment what result would follow an application of the same sort of material to the skin in another region for several days in succession. The remarkable vitality with which the mucous membrane is endowed enables it to retain its integrity for a considerable length of time, but sooner or later its resistance breaks down and it becomes the seat of a chronic inflammation similar to that which affects the mucous membrane of the nose in nasal catarrh.

An examination of the stools shows constantly present mucus and white blood cells, which are thrown off by the mucous membrane in its efforts to defend itself against the attack of the myriads of microbes that are constantly assailing it and against the various highly virulent poisons that they produce. The character of these poisons may be judged by the nauseous odors emanating from the putrefying feces that are discharged when a laxative is administered, and sometimes as the result of an enema.

The frequent bowel movement in colitis is Nature's effort to clear the intestine from

offending material. The movement is due not only to the irritation produced by the stagnation of fecal contents, but to the fact that the contracted bowel relaxes at intervals and permits the passage of material that has accumulated above it. When the bowel is completely contracted, the obstruction is complete. In examining patients suffering from colitis, the writer has often noticed the complete relaxation of the bowel that but a few moments before was so contracted that it could be rolled under the finger like a piece of thick rubber tubing.

In catarrhal colitis the stools may be either liquid or composed of hard lumps somewhat resembling the feces of goats, or they may be mixed in character. The stools are sometimes quite watery, and may contain traces of blood. Patients often think that they are suffering from diarrhea, on account of the frequent semi-liquid discharges. The cause of liquid stools is the irritation produced by the hardened and irritating feces. The irritation is not mechanical, however, but is due to the poisonous and irritating substances that are produced by the bacteria growing in the feces, in other words, by the putrefaction that is taking place.

In many cases there is a quite regular alternation of constipation and diarrhea. The feces accumulate for several days, until the irritation becomes so great that a profuse flow of serum and an abundant secretion of mucus occur. The

mass is thus softened, and temporary relief is obtained through the complete or partial unloading of the bowels by several soft stools.

The ultimate effect of long-continued inflammation of the mucous membrane is the same in the colon as in the nose and other parts provided with a mucous lining. After a time, which varies according to the resistance of the individual and the intensity of the disease, degenerative changes occur in the mucous membrane; its glands disappear, and it becomes thin and parchment-like. The degeneration extends to the muscles that lie beneath the mucous membrane. The intestinal wall is thus thinned and weakened, and the power of contractility to a large degree is lost. The intestine becomes distended and enlarged by gases and fecal accumulation like a greatly distended bladder, losing a large part of its functions as a living muscular tube. It fails to respond to the nervous impulses by which the act of defecation is normally affected, and serves merely as a reservoir, so that it becomes necessary to resort to mechanical means, as an enema of water or oil, for emptying the bowels.

In the treatment of colitis, the measures necessary are comparatively simple. By their thorough application, practically all cases are curable. Only in its advanced, ulcerated stage does the disease sometimes become incurable.

First of all, a change of the intestinal flora

is necessary; that is, the bacteria to which the disease is due must be gotten rid of. It is never to be forgotten that colitis is an infection—not a specific infection such as causes diphtheria or measles and against which an immunity may be established, but a non-specific infection, resulting from the constant presence of a vast number of virulent putrefactive organisms, such as *C. Welchii*, *B. butyricus*, *C. butyricum* and others of like character.

In bad cases, animal food products of all sorts must be avoided. Even milk must be excluded, as well as eggs and meat. As pointed out by Tissier some years ago, the bacteria that produce colitis thrive best upon animal protein.

The diet must be made so bulky and laxative that the bowels move three or four times a day. Four movements a day are better than three.

Use of the enema is necessary in cases of colitis. Notwithstanding a laxative and non-toxic diet, with the free use of bran or agar-agar and mineral oil, preferably in the form of Paramels, the colon is generally so crippled in cases of colitis that it does not completely empty itself and there is constantly left behind an amount of material sufficient to encourage putrefaction and to prevent the healing of the diseased surfaces. Examination with the X-ray shows in these cases a spastic or contracted condition of the descending or pelvic colon, and in many cases a prolapsed condition of the pelvic colon,

which may be adherent. In these cases, the colon must be washed out daily by means of an enema consisting of two or three pints of hot water. The temperature of the water should be 110° to 115° F. The enema should be repeated several times, or until the water returns clear.

The effectiveness of the enema is greatly increased by thorough massage of the colon, especially of the pelvic colon, with the patient in the knee-chest position. When the pelvic colon is distended by the enema, it may be manipulated more effectively.

Are coarse foods objectionable in chronic colitis? is a question often asked. No one would think of suggesting the use of coarse food substances such as fresh vegetables, lettuce, celery, bran, etc., in acute inflammation in which there is an enormous increase of activity of the whole intestine. In chronic colitis, however, the situation is usually different. While the stools are in many cases very frequent, this is due to the chronic irritation that exists in the lower part of the colon. An X-ray examination generally shows in these cases that there is a dilated state of the right side of the colon and often a pouched condition of the cecum, with an accumulation of food residues that have been retained so long as to be in a highly putrescent state. Thus, while the lower part of the bowel is too active, the upper part or right side of the colon is almost paralyzed. It may be, in fact, a veritable

cesspool, acting as an incubator for the bacteria that are the real cause of the colitis.

This state of things must be corrected before any progress can be made toward the cure of colitis. There must be a thorough housecleaning of the colon, and the colon must then be kept clean.

The bland diet that formerly was invariably used, and is still urged by some who have not made themselves familiar with modern knowledge of the nature of the disease, will never cure chronic colitis, for the reason that it increases the delay in the right half of the colon. The bland diet, in other words, does not relieve the chronic constipation, which has, in the great majority of cases, promoted the infection. Coarse foods are needed to stimulate the upper colon to action. Such foods do not increase the colitis, but aid in accomplishing a cure by helping to keep the colon clean.

It is true that when bran and coarse vegetables are used the patient may at first experience some slight pain, but the pain is not due to irritation of the diseased surfaces but to the increased peristaltic activity. A dose of mineral water, a Seidlitz powder or a mild medicinal laxative of any sort will likewise produce pain. Anything that causes a sore or spastic bowel to act will necessarily occasion more or less pain. While the pain is due to action, this is necessary to enable the bowel to empty itself.

Bowel movement, though painful, does not increase the infection, the real disease, but lessens it, just as coughing in pneumonia is painful but useful in getting rid of offensive matters, and does not increase the inflammation.

The slight pain occasioned by the increased peristalsis may be relieved by the application of a hot water bag, or heat in some form to the abdomen. The hot enema also aids greatly in relaxing the bowel and preventing pain.

The use of bran in colitis is often of the greatest benefit. The notion that bran is irritating is so deeply rooted in the public mind that it is not easily eradicated. This mischievous notion has apparently been extensively propagated within the last forty years by the promoters of the roller-mill process for flour-making. In an article combating this idea, the *Journal of the American Medical Association* said, editorially, as follows:

“When properly moistened and heated, bran becomes as soft and pliable as wet paper, and hence produces merely a gentle titillation and is usable for patients even with a tendency to colic.”

Professor Tibbles, the eminent English writer on dietetics, holds that the neglect to use coarse foods is largely responsible for so-called atonic constipation and many cases of chronic intestinal catarrh, mucous colitis and membranous colitis, and the professor adds, “It is therefore impor-

tant in the treatment of these diseases that the food does not lack cellulose and especially woody fiber (bran)."

Von Noorden, one of the most eminent of living medical authorities, insists on the use of liberal quantities of the coarsest foods, including all sorts of coarse vegetables, the coarsest sorts of rye bread (pumpernickel), fruits, gooseberries, grapes and currants, including the skins and seeds. He reports a complete cure in half of all cases treated by this diet alone, and improvement or cure in 75 per cent of his cases. Von Noorden's cases did not have the benefit of the special methods for changing the flora that we now possess. His good results were due to the fact that bran and other coarse foods actually accomplish a considerable change of the intestinal flora by helping to keep the colon empty, and so giving less opportunity for the development of pernicious bacteria.

For relief of abdominal tenderness, usually found in chronically constipated persons especially when colitis is present, very hot fomentations applied two or three times a day for ten or fifteen minutes are almost a sovereign remedy. The moist abdominal bandage used at night with a mackintosh cover is a very old-fashioned and still unrivaled remedy for tenderness, soreness and ill-defined pain in the abdomen. These remedies are more than merely palliative, but are not, of course, in themselves curative unless

the stagnation that gives rise to the congestion to which the pain is due is also cured.

The majority of abdominal pains, tenderness and other miseries, with accompanying back-aches and "dragging" sensations, are due to colitis.

Cases of colitis in which ulceration exists, with discharges of pus and blood, require the attention of an experienced specialist. In such cases surgical treatment is sometimes necessary, in addition to changing the flora, in order to expedite a cure.

When the efficient measures now available for the treatment of colitis can be applied in a thorough-going manner, a cure may be confidently expected with persevering effort in practically every case.

Muco-Membranous Colitis

Muco-membranous colitis is probably only a variety of catarrhal colitis. Of this the writer has been convinced for many years, although most authorities still describe this malady as a nervous disorder. The only particulars in which it differs from catarrhal colitis are:

1. The fact that mucus is not constantly present in the stools as in catarrhal colitis.
2. The presence of membranes that are sometimes complete casts of the bowel, and may be a foot or more in length.
3. Colic-pains.

4. Intermittent occurrence of the symptoms.

These differences are not sufficient to characterize this condition as a distinct disease.

The casts consist of coagulated mucus, and not mucous membrane as patients often imagine. The colic pains are due to violent contractions of the colon, which are excited by the accumulation of gas and irritating fecal matter.

Constipation and a "wild" flora are the predisposing conditions that lie back of this disease, as well as of catarrhal colitis. If the infection of the colon with a putrefactive flora is not sufficiently intense to produce continuous symptoms, it is only necessary that it should be increased by some indiscretion in diet, by exhaustion, by a severe cold, or some other factor, to precipitate an attack.

The treatment of this condition does not differ from that already outlined for the treatment of catarrhal colitis. Medicinal laxatives of all sorts must be avoided, because these only serve to aggravate and perpetuate the disease. Indeed, the use of laxatives, mineral waters, etc., is one of the most common causes of this condition.

The Colon as a Seat of Focal Infection

The escape of bacteria into the blood or lymph streams, and their colonization in distant regions of the body, is known to take place not only from diseased teeth and other foci, but

from the colon, the contents of which furnish a fertile field for bacterial growth. According to Kidd, an English surgeon, absorption of bacteria from the colon is constantly taking place, and on such an extensive scale that the body may properly be called a bacterial sponge.

It was pointed out some years ago by Professor Adami that bacteria are constantly to be found in the liver and kidneys and other vital organs to which they are carried by the blood.

They are also carried by leucocytes or white blood cells, which swallow them and transport them to distant parts of the body. Some of the bacteria swallowed by the white cells are destroyed, but many remain alive and even continue to grow.

Orth and others have shown that pernicious organisms may penetrate the mucous membrane of the intestine and enter the lymphatic channels and thus find their way into the circulation. The spread of bacteria in the body seems, in fact, to be chiefly through the lymphatics rather than through the blood vessels.

Normally the mucous membrane affords protection against the penetration of bacteria into the circulation. This is especially true of the mucous membrane of the colon. The bacteria penetrate the mucous membrane of young infants much more readily than that of adults. When colitis is present, however, the bacteria more readily find entrance to the circulation.

Ficker found that hunger and exhaustion favor greatly the entrance of bacteria and the development of infection, especially the infection of typhoid fever. He suggested that penetration of the mucous membrane of exhausted animals by bacteria was the cause of the rapid decomposition of the flesh of animals killed when in a state of exhaustion, as in the case of hunted animals that have been driven long distances.

Bacteria are, however, able to penetrate the walls of the small intestine and of the vermiform appendix much more easily than the walls of the colon. When, therefore, the ileocecal valve is incompetent, the colon contents are permitted to reflux into the small intestine, through the wall of which bacteria may make their way—via the blood or lymph—to remote regions of the body. Experiments on rabbits have shown that when colon bacilli are injected into the blood vessels at frequent intervals during a period of several weeks, very pronounced changes take place in the liver, kidneys and other vital organs. These changes consist in an increase of connective tissue, which results in fibroid degeneration. In many cases, and probably in a very large proportion of all cases, infections of the tonsils and teeth, and other so-called focal infections, are really the result of the lowered vital resistance produced by long-continued absorption of poisons from the colon.

Dangerous microbes may reach other parts

of the body, from the colon, not only via the blood or lymph streams, but by direct ascension along the intestinal tract.

This ascending infection finally reaches the duodenum, which not infrequently becomes the seat of a chronic catarrhal condition, the result of which may be ulceration. Pain occurring three or four hours after meals is very frequently due to duodenal ulcer. Observations of Moynihan and others have shown that ulcer in this region is three or four times as frequent as ulcer of the stomach.

From the duodenum, infection often travels through the bile ducts to the liver and the gall-bladder. Chronic infection of the gall-bladder, also gall-stones, are thus developed.

The infection may also ascend the pancreatic duct, which is closely associated with the bile duct, and may cause chronic inflammation of the pancreas, one of the results of which may be diabetes. From observations recently made, it is probable that inflammation of the pancreas arising in this way is one of the most common causes of this disease. Observations made in the X-ray department of the Battle Creek Sanitarium indicate that the ileocecal valve is usually incompetent in diabetes. This is a most significant fact.

In view of all these facts it is clear that the colon is by far the most important source of focal infection. Infection of the teeth, tonsils

and sinuses are often themselves of intestinal origin. It is evident, then, that in dealing with chronic disease of any sort, it is the first duty of the physician to give attention to the intestinal tract and especially to the colon.

Proctitis

The infection known as colitis very often extends from the pelvic colon into the rectum. When the lower bowel is involved, the patient suffers from more or less constant pain and uneasiness in this region. There is frequent desire to move the bowels, but however frequently the bowels are moved, there is always some fecal matter remaining in the rectum, together with mucus and occasionally blood.

An examination of the rectum sometimes shows ulceration. In advanced cases, the mucous membrane is smooth and dry, with patches of mucus adhering here and there, and frequently raw surfaces that bleed when touched. The conditions are identical with those that are found in the bowel higher up. The point of junction of the colon and the rectum is a favorite seat for ulcerations and thickenings of the mucous membrane.

When the disease extends deeper into the wall of the bowel, as it does sooner or later, thickening and rigidity result. By extension of the disease through the membranous wall, the outer surface becomes inflamed, and adhesions

may occur between the lower bowel and the bladder, which sometimes result in fistulae between the two viscera. Adhesions may also occur between the colon and small intestine and other parts. The ulcerations may heal and form cicatrices, which contract and produce obstruction. The lower part of the rectum and the juncture of the colon and rectum, the pelvi-rectal valve, usually show the worst effects of catarrhal colitis. The long-continued irritation to which these parts are subjected also leads to the development of other growths, which, together with ulcerations, as has been shown by Mummery, the eminent London specialist, are very prone to develop into cancer.

On this account, every person who suffers from catarrhal colitis, as shown by the presence of mucus in the stools, should submit himself to a physician for examination in order that any existing tendency towards malignancy may be recognized sufficiently early to permit of its radical treatment.

The treatment of proctitis is essentially the same as that already outlined for colitis. Change of the intestinal flora, frequent bowel movements, cleansing of the colon with the hot enema, irrigation after each bowel movement, an anti-toxic diet, and the use of beta-lactose or Lacto-Dextrin to feed the aciduric flora, are the most important measures. Their faithful employment will usually effect a cure.

Appendicitis

Appendicitis, so-called ileal kinks and the various troubles attributed to adhesions in the ileocecal region, are a natural consequence of incompetency of the ileocecal valve and cecal stasis.

The appendix is often visible with the X-ray, the protective valve at its mouth having been forced open by the undue stretching of the gut. This condition was found in 19 (32 per cent) of 60 cases studied by Case.

Appendicitis is not a specific disease, but is simply the result of extension into the appendix of the same infection that, in the colon, gives rise to colitis.

In many, perhaps a majority, of cases of so-called appendicitis, the seat of the disease is the cecum, rather than the appendix. In such cases, removal of the appendix by operation affords no relief, and sometimes aggravates the difficulty by causing adhesions, which still further cripple the bowel by interfering with peristalsis.

In most cases of so-called chronic appendicitis, in which distinct acute attacks have not been noted, the symptoms rapidly disappear when constipation and colitis are overcome by changing the flora and by hot irrigation.

Gall-Stones

Gall-stones are always due to bacteria. Germs are always found in the interior of the concretions.

Recent observations have shown that when putrefying feces accumulate in the colon, great numbers of bacteria pass through the walls of the intestine into the branches of the portal vein, and are carried to the liver. The liver destroys many of these bacteria, but not a few of them pass out in the bile. In this way the gall-bladder often becomes infected, cholesterin is separated from the blood and gall-stones are formed. It is known that cholesterin is present in excessive quantity in meat eaters.

It is possible, also, that infection may occur directly from the intestine. Recent observations have shown that the pernicious bacteria which develop in a neglected colon readily ascend to the stomach and even to the mouth.

Lord Dawson of Penn, physician to the King of Great Britain, expressed the belief that gastritis and catarrhal disease of the duodenum, also disease of the gall-bladder, are the result of ascending infection starting in colitis caused by chronic constipation.

This view, which the writer has held for many years, seems most reasonable, and offers a simple explanation of the origin of common maladies that by many have been attributed to vague and obscure causes.



Radiogram of Gall-Stones

Hemorrhoids and Other Anal Troubles

One of the most common results of straining at stool, occasioned by the presence of dry and hard feces in the rectum and lower colon, especially when prolonged or repeated several times daily, is hemorrhoids, or piles. These are excrescences that form just in the anus, or at its lower edge. The accumulation of fecal matters in the rectum obstructs the flow of blood in the veins that have their origin at this point. In straining these veins become greatly distended with blood and their walls become thickened, forming irregular masses that are usually forced out when the bowels move.

The hemorrhoids gradually increase in size, until they may become so large that the anal sphincters are overstretched and become relaxed. In time the rectum may be pushed outside whenever the bowels move. Prolapse of the rectum is most liable to occur in children and emaciated adults.

The pain and inconvenience from hemorrhoids is usually the result of infection. The distended veins do little harm unless inflamed. The infection results from the retention of fecal matter in the folds of the mucous membrane. Straining at stool distends the veins and cracks the mucous membrane, thus opening up channels for infection. Abrasions are often produced also by rough toilet paper and by lack of care in the insertion of an enema tube.

When the hemorrhoids become inflamed, dry calomel or a mixture consisting of equal parts of calomel and starch should be applied after each bowel movement and after thorough cleansing of the parts. Persons who are suffering from hemorrhoids should apply carbolated vaseline regularly every time the bowels move.

Suppositories of carbolated cocoa butter may also be used with good effects. The suppository should be introduced after each bowel movement, the parts having first been well cleansed.

When the bowels move freely three or four times a day, hemorrhoids are rarely troublesome, at least when the precautions above recommended are employed. In many cases they apparently disappear. When persistent, however, they should be removed. This may be done with perfect safety and with so little inconvenience that no one who suffers from hemorrhoids should hesitate to have them removed. Chronic irritation is an invitation to cancer.

Fissures and fistulae, arising from abscesses about the anus, generally follow hemorrhoids, and are due to infection from putrefactive feces.

The flora should, of course, be changed and kept changed, the stools softened by a laxative diet, and constipation relieved. It is also important that the anal region should be carefully cleansed with water after each bowel movement. A water jet has been devised that is very effective for this purpose. It is best to cleanse the

parts while the anus is still relaxed, so that the anal canal, as well as the margin of skin about the anus, may be reached. When fecal matter is left behind in the folds of the skin or mucous membrane, infection readily occurs, the result of which may be hemorrhoids, ulcer, fissure, or an abscess that may result in a "blind" fistula or a complete fecal fistula.

A Hindoo regards it as a religious duty to cleanse himself with water after every bowel movement. A missionary told the writer that he was once interrupted while holding service in a Bengali village by a native who rose up and shouted, "This man isn't fit to preach. He wipes off with paper." The entire audience fled as though from a leper. We have much pity for the poor heathen, but may learn not a few lessons in self-respect and personal cleanliness from these benighted children of Nature.

Among the Javanese and the residents of the Dutch settlements, the tissue paper universally found in water closets in this country and Europe is never seen. Instead, in every water closet will be found in a box a dozen bottles filled with water, intended to be used in cleansing the anal region.

Hemorrhoids, fissures, ulcers, fistulae and other affections of the anal region may give rise to constipation by mechanically obstructing the outlet of the bowel, or more frequently by causing a spasm of the sphincter ani that prevents

normal evacuation. In such cases surgical intervention is often required, and when accompanied by the use of the measures described in the laxative program, complete success is usually attained.

Thanks to the improvements made in this branch of surgery within the last few years, the painful and drastic methods formerly in vogue are very rarely required. In most cases, methods that are unaccompanied by pain, either at the time of the operation or afterwards, are found entirely adequate.

Persons whose anal sphincters have been paralyzed by disease or by careless surgery often keep the bowels constipated to avoid annoyance from incontinence. In such cases it is of course necessary first of all to remedy the anal defect. This may usually be done by a skillful surgeon, and the operation is attended by no serious risk.

It must not be forgotten, however, that these diseased conditions are themselves the result of constipation as well as the cause of it. After the operation has been performed, the same conditions that gave rise to the local disease may still exist. These conditions should, therefore, receive attention.

HOW TO CHANGE THE FLORA

The penetrating intelligence of Victor Hugo recognized the vicious character of the neglected colon even before Metchnikoff and Bouchard had exposed its malign and destructive influence upon every bodily function. Hugo thus picturesquely characterizes the colon: "The serpent is in man. It is the intestine. The belly is a heavy burden; it disturbs the equilibrium between the soul and the body. It fills history. . . . It is the mother of vices. The colon is king."

This view of the colon justified Sir Arbuthnot Lane's summary method of dealing with the problem by extirpating the organ. But we have in recent years learned that it is after all not the colon but its contents that must be regarded as the disturbing factor. As Keith, the eminent English anatomist, said, "The fault is with the fuel, not the engine."

The colon needs to be reformed, not ablated; that is, the flora of its contents needs to be changed from putrefactive to aciduric.

Changing the intestinal flora from putrefactive to aciduric is by no means a panacea, but it does eliminate a great health handicap that is found to be a factor even in many maladies not directly associated with the alimentary tract.

There is perhaps no therapeutic measure known by which the vital factors that make for physical regeneration and increase of vital resistance may so readily and so greatly be increased, and by which the burdens and handicaps that clog and hamper the vital machinery are so promptly removed, as by change of the intestinal flora.

With the natural defensive mechanisms crippled, the tissue fluids become more and more saturated with toxic products and the bodily conditions become such as in the highest degree to promote functional disturbances and degenerative structural change.

Under these conditions certainly nothing could be more rational than the cutting off by a change of flora of the incoming tide of colonic poisons.

Intestinal Antiseptics Useless

Although Bouchard demonstrated that intestinal poisons result in autointoxication, he did not solve the problem of preventing or curing the condition. Numerous investigators experimented with methods of getting rid of the undesirable flora. Their first thought was to sterilize the intestinal tract and thus to get rid of all germs. Experiments on insects and animals had apparently demonstrated that the flora was of no vital use to the body, and that the ideal situation, in perfect health, would be an absolutely sterile colon. The natural conclusion

from these observations was that infections of the intestinal tract might be successfully combated by means of antiseptics or germicides, provided substances could be found that would destroy the bacteria without doing harm to the body.

Hundreds of different substances were tested, each in turn being extolled to the skies as the *ne plus ultra* of intestinal antiseptics, only to be discarded when submitted to the test of extended clinical application. Salol, beta-naphthol and a host of others each had its day and each proved to be as great a failure as its predecessor. The reasons are obvious:

First, any substance that will destroy putrefactive bacteria will harm the delicate tissues of the intestine, and when absorbed will do damage to the liver, kidneys and other structures with which they come in contact.

Second, a drug that will destroy putrefactive bacteria will also destroy the protective, acidophile organisms, and so leave the body unprotected against a new invasion of harmful organisms.

After Stern demonstrated that beta-naphthol and other antiseptics do not diminish the number of intestinal bacteria, Quincke, in a work on intestinal autointoxication, remarked: "It was natural to search for another method of combating the decomposition caused by bacteria in the intestine, and the idea came to me of trying

to supplant the injurious bacteria by beneficent ones, just as weeds are suppressed by the growth of useful crops, the starting point being the antagonism of different microbes observed in artificial culture media." Quincke tried to make the change by feeding yeast, but without success.

Combe, one of the first clinicians to make a practical application of the views of Bouchard and of Metchnikoff, after a trial of many different germicides renounced them as useless and pinned his faith upon biologic methods.

Nature's method is not to maintain a sterile condition of the intestine, but to maintain in the intestine a vigorous growth of harmless, protective, acid-forming bacteria, and thus to prevent the growth of putrefactive organisms to which the fermentative are antagonistic. It is evident, therefore, that the remedy for intestinal toxemia is not to be found in drugs that destroy bacteria, but in foods that encourage the growth of the protective bacteria and do not leave residues of a character to develop growth of the harmful sort.

Biologic Asepsis

If one finds thistles, dandelions and weeds of various sorts growing in his front lawn, he knows that the grass is running out and must be renewed by pulling up the weeds, applying fertilizer and giving the grass a better chance to grow. In other words, the lawn needs to have

its flora changed. This is exactly what is meant by *changing the intestinal flora*. It is to get rid of the putrefactive germs, which have somehow gotten in and displaced the protective, acid-forming germs, and to make the condition of the intestinal contents such that the acid-forming germs can establish themselves and become the dominant flora.

Escherich, even before the discoveries by Metchnikoff, recognized the necessity for changing the flora of the intestine, suggesting, "It is necessary to employ the 'acid fermentations' as antagonists of the 'alkaline fermentations' (putrefactions), either by adding to the diet carbohydrates, such as lactose, or by giving cultures of acid-producing bacteria." This, so far as the writer knows, was the first suggestion of the desirability or possibility of changing the intestinal flora. Escherich was one of the ablest bacteriologists of his time. He made important pioneer studies of the stools of infants, and started fruitful lines of inquiry that his premature death left others to carry on.

The biologic method of suppressing intestinal putrefaction was discovered by Tissier of the Pasteur Institute, when assistant to Metchnikoff. Tissier found that when a putrefying beefsteak was placed in buttermilk, the putrefaction ceased. He naturally concluded that by the use of buttermilk, putrefaction in the intestine might be suppressed.

When Tissier found in Bulgarian buttermilk, known as yogurt, a flora that seemed to be identical with the acid-forming organisms found in the human intestine, Metchnikoff proclaimed the Bulgarian sour-milk germ as a panacea for colon troubles and the various maladies that result from autointoxication.

The writer happened to be in Paris when Metchnikoff began popularizing Tissier's idea of changing the intestinal flora by feeding a culture of acidophile bacteria, and brought home with him the first of his *B. bulgaricus* cultures. A thorough trial was given them but the cultures proved a failure. The writer later learned from Tissier that Metchnikoff himself had never succeeded in changing the flora with the *B. bulgaricus* except to a small degree in a single case.

The method failed because Metchnikoff did not recognize the biologic difference between *B. bulgaricus* and *B. acidophilus*. The two organisms look alike but differ in the fact that one (*B. acidophilus*) is capable of developing and flourishing in the intestine, while the other (*B. bulgaricus*) is not.

Notwithstanding this serious error, Metchnikoff's work was not by any means wholly discredited. He proved, as others before had demonstrated, that the character of the intestinal flora is a matter of great moment, and that the blood stream may be invaded by the bacterial

exo- and endo-toxins, and even by pathogenic bacteria.

The Significance of Lactose in Milk

In the infant's food, lactose is the carbohydrate supplied for feeding the protective, aciduric flora that suppresses the putrefactive. Mother Nature protects the intestine of the infant by taking advantage of the antagonism between the fermentative and the putrefactive organisms which inhabit that area, since the fermentative organisms, *B. bifidus* and *B. acidophilus*, produce lactic acid in great abundance and the putrefactive organisms cannot grow in this acid medium. In infancy, digestive disorders begin soon after weaning because of inadequate protection by lactose. Sittler demonstrated that by adding lactose to cow's milk, the stools of bottle-fed babies could be made rich in aciduric organisms like the stools of nurslings. Herter and Kendall found that, after the addition of lactose to the milk fed to cats, cultures of their stools showed a flora made up almost wholly of *B. bifidus* and *B. acidophilus*.

Hirschler and Winternitz showed that lactose lessens putrefaction. Torrey and Coleman changed the intestinal flora in a case of typhoid with lactose. The character of the stool was markedly changed and the course of the disease modified. Nearly thirty years ago Amann of Lausanne cured his daughter of acute enteritis

by the use of lactose (Combe). The acid state induced by the presence of lactose has also been shown to be unfavorable to the development of amœbæ and other animal parasites. The presence of lactose in the milk of all animals is thus shown to be a fact of much significance.

Disease-producing and poison-forming germs do not flourish in a culture medium containing lactose, and therefore cease to produce the toxins to which they owe their destructive character. The diphtheria bacillus, for example, in a lactose medium loses its virulence and produces no toxin (Kendall). When lactose is applied to offensive wounds, the malodorous discharge quickly disappears and healing begins. This special property is possessed by no other sugar.

Another property of lactose, in which it differs from all other sugars, is the slowness with which it is absorbed. Other sugars are absorbed so rapidly that they disappear from the intestinal tract in its upper part, and never reach the lower intestine, where sugar is needed to feed the corrective bacteria and prevent putrefactive changes. Lactose is so slowly absorbed that it is possible, by taking it in liberal doses, to distribute it through the whole intestinal tract, and thus to suppress putrefaction and the growth of disease bacteria from one end of the intestine to the other. This is a matter of the highest importance, for every part of the intestinal tract needs protection, and especially the colon.

"Simnitski experimented upon the antiputrefactive action of the different sugars, and he reached the conclusion that the best and most antiputrefactive sugar was lactose." (Combe.) In the presence of lactose, Simnitski found no production of indol, phenol, ammonia nor sulfuretted hydrogen at the expense of albumin.

Rettger and Hall of Yale University demonstrated that of all the different sugars, lactose alone changes the flora to the fermentative, protective type.

In fact, the commonly used sugars may produce harmful effects. Says Cruickshank, "The administration of glucose, saccharose [cane sugar] and of maltose is associated with an increase only in the numbers of streptococci" [pus forming germs]. (*British Medical Journal*, Sept. 29, 1928.)

The remarkable power of lactose to destroy dangerous and offensive bacteria is conclusively demonstrated by the following experiment devised by Cruickshank: Half a pint of milk is placed in a flask. To this a gram (quarter teaspoonful) of fresh fecal matter is added. The flask is then placed in an incubator with a temperature of 100° F. At the end of ten days, examination shows that the colon bacillus and other offensive species of bacteria are dead, leaving a nearly pure culture of *B. acidophilus*. The odor and flavor of the milk are like those of acidophilus milk. This experiment not only

proves that lactose will destroy undesirable bacteria and establish a protective aciduric flora, but it also demonstrates most conclusively that the *B. acidophilus* is always present in the colon and only needs encouragement by lactose feeding to enable it to become dominant and thus change the intestinal flora.

All authorities in dietetics caution against the free use of cane sugar, which, when concentrated, as it always is in candies, jams and syrups, congests and irritates the stomach and duodenum, thus causing hyperacidity and possibly gastric and duodenal ulcer. The enormous increase in the use of cane sugar in recent years may be responsible, in part at least, for the steady increase in gastro-intestinal disorders, probably by an irritating effect upon the duodenum.

Corn sugar or glucose is of no use as a food for the protective flora. Malt sugar is wholesome and palatable. The new sugar, beta-lactose (B-lac), should replace the cane product for table use.

Lactose is, then, the real answer to the problem of changing the flora. It is Nature's own solution, since she puts lactose into the first food of every infant, and thus supplies the young mammal, human or animal, with food for the protective, aciduric flora, which is maintained as long as lactose is supplied in adequate amount.

Lacto-Dextrin

The insolubility of lactose, its chalk-like consistency and its lack of flavor, added to the large doses required, were serious obstacles with many patients to its use. But a more serious difficulty was found to be the fact that now and then the appearance of sugar in the urine of a patient showed that the limit of sugar tolerance had been overstepped. It became evident at once that persons with low sugar tolerance might easily develop urinary sugar under repeated dosing with 3 or 4 ounces of lactose three times a day. Such a dose is, in fact, approximate in amount to the usual test dose for sugar tolerance.

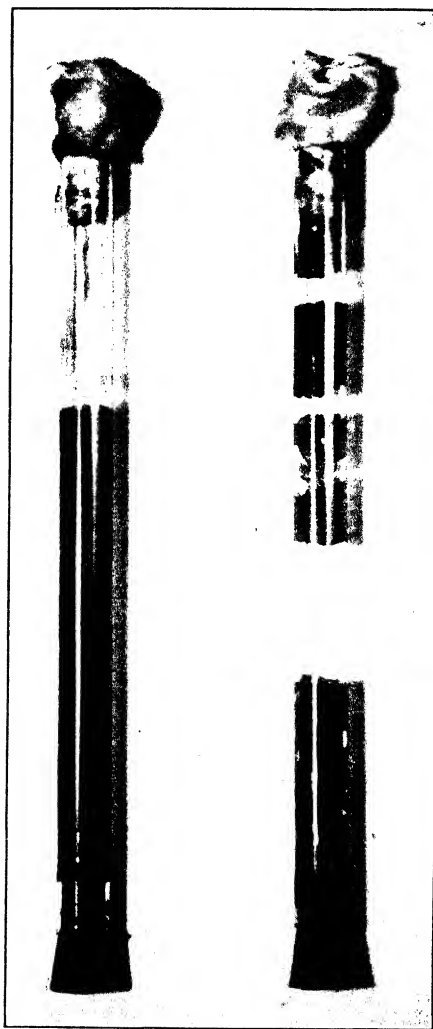
Meantime, Distaso, a former assistant of Metchnikoff, working in the Royal Institute of Public Health of London (1911), also Schiller, and later Rettger, showed that dextrin, used in liberal quantity, might change the intestinal flora from putrescent to aciduric. A series of careful observations on human beings have shown that dextrin, even in very liberal doses—one-fourth of a pound or even more—does not raise the blood sugar (Grant).

An effort was made to use dextrin, but without success. A rat can be made to eat dextrin, but the swallowing of three or four ounces of ordinary dextrin is a task quite too difficult for any person but an enthusiastic and well-trained experimentalist to undertake. The objectionable features of both lactose and dextrin were finally

overcome by combining the two, not by simple mechanical mixing but by adding lactose to an especially prepared dextrin in such proportions as to produce a readily soluble, highly agreeable product easily within the range of minimum normal sugar tolerance, and one that may be used without difficulty for an indefinite period of time.

Changing the intestinal flora is, therefore, no longer a difficult or uncertain procedure. Methods of such efficiency and dependability have been developed that efforts to change the flora may be undertaken with the same assurance of attaining the desired results as that with which one undertakes to increase or diminish the bodily weight by proper feeding. It may now be confidently said, therefore, that the biologic problem, upon which Metchnikoff and his associates labored unsuccessfully for many years, has at last been solved.

When a protective or aciduric flora is maintained without interruption, digestive and intestinal disorders rapidly disappear. Stasis, or stagnation in the intestines, usually disappears also. If there still remains some degree of stasis, less harm is done because putrefaction, with the resultant development of poisonous products, is prevented. Colitis, so-called "biliousness," gastralgia, lack of appetite, heaviness or other distresses after meals, rarely persist for any length of time. The tongue clears, the breath becomes



A

B

A Culture of the Gas Bacillus.

Veillon Tube Cultures Showing, A. Flora Changed, No Gas;
B. Putrefactive Flora, Welch's Bacillus, Much Gas.

sweet and a sense of freedom, buoyancy and fitness takes the place of the old weariness, depression and inefficiency. The various symptoms of indigestion and other discomfort due to chronic duodenitis rapidly disappear.

Acidophilus Milk and Other Cultures Not Essential

When lactose or dextrin is given without cultures, the protective flora develops promptly because Nature supplies the culture for older children and adults as well as for nurslings. In fact, *B. acidophilus* is always present in the intestines, often in very small numbers only, but sufficient in numbers quickly to develop an aciduric flora when a sufficient amount of lactose or lactose and dextrin is supplied in the diet.

This is clearly shown in an observation by Cruickshank, the eminent bacteriologist of Aberdeen, Scotland. He inoculated milk with feces and obtained an abundant growth of *B. coli* and enterococci the first few days, but after seven to ten days found a vigorous growth and almost pure culture of *B. acidophilus*. This important observation the writer has often verified.

The inconvenience involved in the use of cultures, and the great uncertainty of their quality, are formidable obstacles to their use. Fortunately they are not necessary. Nature will supply the germs. She has plenty of them. They

are everywhere. Every baby gets a supply within twenty-four hours after it is born, as does every little milk-fed nursling of every species of animal born into the world. They are in the colon already, waiting for a chance to grow, when the right food reaches them in sufficient amount, whereupon they will take on a luxuriant development.

The protective germs are plants. Like all other plants, they flourish in the soil that meets their requirements, and run out in a soil not suited to their needs. The food residues that collect in the colon are the soil in which the germ plants of the intestinal flora grow. When these residues contain a sufficient amount of carbohydrate, a good flora develops and is maintained. When the residues consist chiefly of undigested protein, especially protein of animal origin, such as remnants of beefsteak, chops or roasts, eggs or even curds, a bad or putrefactive flora will be the natural and necessary result.

If the refuse is retained in the colon too long, the food for the protective germs will all be consumed and only the type of residue upon which putrefactive organisms flourish will remain. The putrefactive bacteria quickly become dominant; the flora becomes changed from good to bad. The bile, intestinal mucus and other secretions also furnish food for putrefactive bacteria.

A sufficient amount of lactose and of dextrin

must be taken to insure the constant presence of acid-forming germs in the intestine until the food residues are evacuated. As soon as lactose disappears from the intestine, the *B. coli*, *C. Welchii* and other putrefactive organisms always present begin at once to develop. The stools become alkaline and the flora putrescent.

Because of this, a person may have a good flora in the cecum and a bad one in the pelvic colon. Not infrequently, an alkaline and putrescent stool is followed an hour later by an acid or almost odorless stool. The difference between the two stools is due to the fact that the mass of residues that composed the first stool was so long retained in the lower bowel that the lactose and lactic acid which protected it was absorbed, thus permitting the development of the putrefactive flora.

How the Flora of a Beefsteak was Changed

A simple laboratory experiment proves conclusively that a putrefactive flora may quickly and certainly be changed without the use of acidophilus milk or cultures of any sort. Put into a wide-mouthed jar four ounces of lacto-dextrin. Add one quart of warm water. Immerse in the solution a half pound of beefsteak. If the steak is distinctly tainted, the experiment will be all the more impressive. Change the solution every other day for a week or two. At each change the putrid odor will be found less pro-

nounced until it wholly disappears and only a slight sour odor remains. An examination of the solution by a bacteriologist will show only fermentative bacteria. All putrefactive bacteria will have disappeared.

If the solution is changed once in a week or two, the meat may be preserved intact for an indefinite length of time. A beefsteak treated as described on May 15, 1925, is still (February, 1931) wholly free from Welch's bacillus and other putrefactive organisms.

When it is remembered that fresh meat always swarms with putrefactive bacteria, colon germs of the same sort as grow in the human colon, the number often running into many millions, it will be seen that this is a most severe test.

If lacto-dextrin will change the flora of a beefsteak in a glass jar, it will certainly do the same for remnants of beefsteak in the human colon.

How to Maintain an Aciduric Flora

The change of flora so readily induced by lactose or lacto-dextrin is, of course, temporary. A return to the ordinary diet will cause a quick return of the old flora, as shown by the putrid character of the stools and often by a return of headache, coated tongue, foul breath and other symptoms that have disappeared with the suppression of intestinal putrefaction.

Experiments by the writer to render lactose more soluble resulted in the development of a method by which alpha-lactose, rendered almost insoluble by the process of separation from milk or whey, may be separated from beta-lactose, which is three times as soluble and more than three times as sweet.

By the regular use of lactose in this latter form, it may be made to afford the same protection to older children and adults that the lactose of mother's milk gives to nursing infants, who are practically immune to digestive and bowel disturbances as long as mother's milk is their exclusive diet.

Beta-lactose, commercially known as B-Lac, is now available for table use and may be substituted for cane sugar, not only at the table, but for many culinary purposes. B-Lac has a delicious, sweet flavor, milder than that of cane sugar, but more pleasing to the palate, especially of infants and children. When added to their food it affords a biologic protection that is almost an insurance against the gastric and intestinal disorders to which children are so greatly liable as the result of bacterial infection from contaminated milk, fruits and other sources.

Beta-lactose is, therefore, highly recommended as a complement of lacto-dextrin, which is now generally recognized as the most effective means of changing the intestinal flora. When the flora is being changed by the use of

lacto-dextrin, the desired effects will be obtained much more certainly and quickly by the table use of beta-lactose in place of other sugars.

By the habitual use of beta-lactose, two very important things are readily and dependably accomplished: (1) A protective, aciduric flora is maintained; and (2) the injuries resulting from the use of ordinary cane sugar are avoided—not only the digestive and other disorders attributed to this sugar by many authorities, but also the increase of streptococci and other highly harmful types of bacteria that cane sugar may induce.

The "Fruit Regimen"

Metchnikoff's observations on a South American fruit bat led the writer to undertake experiments that resulted in the development of a dietetic method by which the flora may very notably be changed and intestinal putrefaction suppressed. Metchnikoff noted that the stools of this South American bat, which fed on bananas, were practically sterile, containing only a few "air" germs; that they showed no evidence of putrefactive change. Tissier found that on a diet of dates, putrefaction was almost wholly suppressed.

One of the chief obstacles first encountered in the employment of a fruit diet was insufficient activity of the colon. The writer observed this many years ago (1914), when, for the first time,

he became able to secure fairly uniform results in changing the flora by increasing the activity of the colon.

The dietetic method then developed was designated as the "fruit regimen," in contradistinction to the so-called fruit diet. This "fruit regimen" consists of fruit, preferably uncooked, with the addition of bran, agar, mineral oil and, in recent years, psyllium seed, in sufficient quantities to secure three or four bowel movements daily, with the addition, if needed, of a hot enema at bedtime to secure as complete a clearance as possible of residues from the lower bowel. A few days of this regimen makes a notable change in the character of the stools, a bacteriological examination showing more aciduric organisms and less "wild" bacteria.

The fact that the flora may be changed by means of a "fruit regimen" is the secret of the success of the "grape cure," the "peach cure," the "apple cure," the "cherry cure" and various other fruit cures that have been practised for hundreds of years in European countries. The fruit diet consists essentially of carbohydrate. With the accessories mentioned, the cellulose swallowed is sufficient to secure efficient intestinal activity, and to insure that enough carbohydrate finds its way into the colon to promote the growth of an aciduric flora.

Fruit of any sort, either raw or stewed, may be employed.

Recently it has been noted that tomato juice greatly stimulates the growth of *B. acidophilus*.

Cereals, eggs and milk must be prohibited for a few days when employing the "fruit regimen." The patient takes three or four meals a day of fruits with the above-mentioned food accessories for increasing the bulk, and may eat fresh fruit between meals if he feels so disposed.

The "Milk Regimen"

Another dietetic method of changing the flora is known as the "milk regimen." A careful study was made of the effects of a milk diet on the flora, and it was found to be highly favorable if the amount of milk was large enough (5 or 6 quarts) and if care was taken to add to the milk a sufficient amount of bulk or roughage (bran, agar, mineral oil or psyllium seed) to obtain three or four efficient movements daily.

The increased bowel activity was found to be a very essential part of the milk regimen. If stasis occurs, the lactose associated with the curds that find their way into the colon is absorbed and putrefaction of the coagulated casein takes place. One of the worst cases of intestinal toxemia that the writer ever met was that of a woman who had been on a milk diet for four weeks.

On account of the deficiency of iron in milk, purées of spinach and other greens are also given twice a day in this regimen, and fresh

fruit is used freely to insure an abundant supply of vitamins B and C.

By means of this milk regimen, a very marked change in the character of the stools may be secured in many cases within a week or ten days, doubtless the result of the large quantity of milk sugar or lactose thus ingested, which amounts to five or six ounces when four or five quarts of milk are administered. By adding two or three ounces of lactose or lacto-dextrin to each quart of milk, the total quantity may be reduced to two or three quarts per day.

Poehl showed (1887) that milk lessened putrefaction and that sour milk was more effective in suppressing putrefaction than sweet milk. Sour milk has been in general use from prehistoric times, doubtless because of its anti-putrefactive properties.

Whey has long been much used in Europe and found helpful in suppressing putrefaction.

Fresh buttermilk was employed by de Jager and other Dutch physicians for suppressing putrefaction more than fifty years ago. Koumiss and kephir have been extensively used for the same purpose and with some success, when used in sufficient quantities.

But the use of soured milks for changing the intestinal flora, after having a wide vogue for some years a generation ago, fell largely into disuse because of various objectionable features. It was found, in fact, that some patients were

made worse instead of better by milk feeding. While the use of buttermilk and koumiss has seemed to succeed remarkably in certain cases, in the majority of cases the relief obtained has been temporary, and often their use has been attended by complete failure.

The reason for this was the fact that the acid-forming germ of sour milk is not able to live in the large intestine because of the absence there of oxygen. This is the particular part of the alimentary canal in which the poison-forming anærobes, the putrefactive germs, are found in largest numbers, especially in the cecum.

Acidophilus milk of good quality is preferable to ordinary buttermilk, but is very difficult to make and is seldom obtainable. It rapidly deteriorates and soon becomes no better than ordinary sour milk. Another objection to acidophilus milk is the fact that its efficient use involves the use of a considerable excess of animal protein. None of these dairy products are effective unless used in large amount on account of the small percentage of lactose in cow's milk (4 per cent). Torrey has clearly shown that the large amount of protein greatly encourages the growth of putrefactive bacteria in the intestine, the very thing that must be suppressed. This is especially important in cases of Bright's disease, when renal efficiency is often very low, and in all cases in which the blood shows a high percentage of non-protein nitrogen.

The benefit derived in some cases from whey, buttermilk and sour milk may be attributed, no doubt, to the lactose that they contain, rather than to the presence of acid-forming germs.

It must not be forgotten, moreover, that many persons are sensitized to milk, and therefore cannot take it even in small amounts without suffering from serious symptoms. Also, it has long been known that milk must be wholly excluded from the diet in cases of acute colitis, cholera infantum and most forms of acute intestinal infection. In many cases of chronic colitis, also, milk is found harmful.

While both the "Fruit Regimen" and the "Milk Regimen" are efficient means of favorably modifying the intestinal flora, the Lacto-Dextrin method is so much more efficient, it is often advantageous to combine one or the other of these regimens with the lacto-dextrin. For example, if to the "Fruit Regimen" are added liberal doses of lacto-dextrin, the change is accomplished much more quickly and completely than when either method is used alone. The same is true of the "Milk Regimen."

The Influence of Constipation on the Flora

Putrefaction develops quickly if the residues are retained beyond the limit of time clearly indicated as the normal evacuation cycle. In all efforts to change the flora, care must be taken, therefore, to keep the colon working efficiently,

and as free as possible from residues. Stasis or stagnation is the beginning of most colon troubles.

Retention of putrescible material in the colon for so long a time as forty-eight hours necessarily results in putrefaction even though the protein ration is comparatively low, since there will be found in the food residues a sufficient amount of unabsorbed protein to furnish a favorable nutrient medium for the growth of putrefactive organisms. When the residues are long retained, the carbohydrates necessary for supporting an aciduric flora are so completely absorbed that acidophile organisms cannot develop, and thus an opportunity is afforded for the growth of *B. proteus*, *C. butyricum*, *C. Welchii* and other putrefactive organisms.

B. coli, which in the presence of carbohydrates does not act upon protein, under these conditions becomes active in breaking up the partially digested proteins. It thus appears that the *B. coli* plays a Dr. Jekyll and Mr. Hyde rôle in the intestine. As first pointed out by Bienstock, when lactose or other suitable carbohydrates are present in the intestine, *B. coli* is harmless, producing only acids, but as soon as the carbohydrates disappear from the culture medium, the bacillus at once renews its attacks upon proteins, and produces indol, phenol and ammonia.

Any drug cathartic used in a vain effort to

cure constipation will have an effect on the flora similar to that of overeating, by causing undigested food to enter the colon in considerable quantities. A laxative that does not move the bowels, but only hastens the contents of the small intestine into the colon, increases toxemia, causing headache, flatulence and exhaustion.

It is evident; then, that to be successful any attempt to change the intestinal flora should be accompanied by means to accelerate peristalsis, in cases when the normal rate is slowed by a crippled colon, and to insure the prompt evacuation of alimentary wastes, the principal means of accomplishing which have already been described in previous chapters.

In brief, these measures include the regular use of fresh vegetables and fruits, and an abundance of bulk or roughage in the form of bran or agar and psyllium seed, also mineral oil. All of these food accessories, in such quantities and combinations as are rendered necessary by the conditions present in each individual case, must be used regularly. By "regularly" is meant not once or twice a day, but at each meal. Their omission at a single meal may cause a stasis or stagnation at some weak spot in the crippled colon that may disturb the rhythm of waste elimination for several days.

A badly crippled colon may require three or four times the amount of bulk needed by a normal colon. The requisite doses for each in-

dividual must be determined by experiment. Beginning with liberal quantities, say a large tablespoonful of bran or a small tablespoonful of Psylla and a couple of teaspoonfuls of mineral oil (emulsions are much less efficient) or one Paramel, the amount is increased from day to day until the quantity necessary to produce results is reached.

In many cases, mechanical cleansing by the aid of the enema will be found necessary for a few weeks while the flora is being changed and the colon is being trained to more efficient activity. The best time for administering the enema is just before retiring. To go to bed with a colon containing toxic residues is almost as harmful as to go to bed in any other state of intoxication. In both instances, damage is done to the body cells by poisonous material. The quantity of water for the enema should be two quarts, the temperature 110° to 115° F.

The bedtime enema does not prevent the occurrence of natural bowel movements after eating, but encourages such natural movements by removing obstructing accumulations in the lower colon. The bedtime enema is made necessary in many cases by the fact that the colon is so crippled that while natural movements occur, they are inefficient, leaving behind in the colon a considerable amount of residue. So long as the bedtime enema produces results, it should be continued.

These simple physiologic means are radically different from laxative drugs of all sorts. They do not produce results by forcing the bowel to act but by assisting. By their systematic use the colon may gradually be trained to behave in a nearly normal way. When the right formula of diet, including lactose, is established for an individual case, it must be carefully adhered to, not only for a few months but for years and often an entire lifetime, for the reason that in serious cases of constipation, the colon has been so badly crippled that complete restoration to normalcy is not to be expected.

Autointoxication Without Apparent Constipation

It is entirely possible for a person to suffer from intestinal toxemia on account of wrong flora without constipation, as in cholera morbus, the diarrheas of infancy, chronic diarrhea and colitis; but it is apparently impossible to have constipation without intestinal autointoxication. If symptoms of toxemia are not apparent in every case, it is no evidence that they are not present. The body is unduly exposed to the toxic influences of the putrefactive flora, in a condition of constipation, even though the body may possess to such an extraordinary degree the power to defend itself against these intestinal poisons that immediate visible effects do not appear.

FOOD A CAUSE AND CURE OF CONSTIPATION

Food is Nature's laxative. Natural food, taken in the proper manner and at proper intervals, gives to the alimentary canal just the kind and amount of stimulation that is required to maintain the normal procession of material along the digestive tract, and to effect the prompt discharge of unusable residues and poisonous wastes from the body.

No attempt should ever be made to treat a case of constipation without proper regulation of the diet. Such a course, no matter how gratifying may be the results for the time being, must end in disaster; for a physiologic and biologic diet is of all things most essential for securing normal action of the intestines.

The Eating Reflex

The taking of food is the most active of all natural excitants to bowel action. Eating sets up in the stomach a series of vigorous peristaltic movements, which pass from the stomach along the whole length of the digestive tube. Hurst of London has demonstrated that the advance of food residues in the colon is almost imperceptible except during the taking of food. This explains the desire for evacuation experienced

after each meal. Bowel movement usually occurs in healthy nursing babies soon after they are fed. The same is true of horses and other domestic animals.

It has been shown that even the smell of agreeable food is sufficient to cause increased intestinal activity. The act of swallowing also excites intestinal activity.

Thus, the natural time for the bowels to move is soon after eating, and under fully natural conditions a bowel movement occurs after each meal. The writer has met a number of persons whose intestines were so sensitive to the stimulation of food that the taking of food at any time, even in a small quantity, had the effect of producing within a few moments a "call" for evacuation. Cases are occasionally met in which the taking of food produces such strong stimulation that the patient finds it difficult to finish a meal without interruption by the demand of the bowels for evacuation.

Roentgenologists have demonstrated that the stomach and small intestine are in almost constant action. Peristaltic waves pass over the stomach several times a minute. Even when empty, its activity continues and, in fact, may increase, finally becoming so violent as to produce, as shown by Cannon of Harvard University, the sensation of hunger. The small intestine continues to act as long as any portion of food remains to be acted upon, only becoming

quiet after all food residues and wastes have been pushed forward into the colon.

But the colon behaves more like a receiving chamber. It is, in fact, the garbage receptacle of the body, serving chiefly to receive and to pass out of the body the unusable residues of food besides certain body wastes that are excreted through the intestine. Careful X-ray examinations of the colon show it to be almost entirely inactive except during and immediately after the taking of a meal, thus showing the influence of the eating reflex.

In constipation, the stimulating reflexes are often weak, and must be reinforced by every means possible. Hence the diet must be so managed as to secure the maximum amount of stimulating influence upon the lower bowel. Eternal vigilance is necessary; every meal must be eaten with reference to the bowel action. The omission of a single meal, or a meal of unsuitable food, may be sufficient to produce stagnation, and unless this is at once corrected, the most serious results may follow. The taking of food, then, serves a double purpose; it supplies the body with needed nourishment and at the same time furnishes the needed impulse to enable the body to get rid of the unusable residues of a previous meal and of a portion of its constantly accumulating intestinal excretions.

The eating of some simple fruit half an hour before retiring will stimulate the eating reflex

and thus help to secure an evacuation of the bowels before going to bed. Sleep with the colon free from offensive residues is sounder and more refreshing. A thoroughly efficient, normally acting colon will evacuate the residues of breakfast some time between supper and bedtime.

Importance of Thorough Mastication

Insufficient mastication is a fault peculiar to civilized man. Savages as well as monkeys, and all lower animals that are provided with teeth for grinding food, masticate their food with the greatest thoroughness. The accompanying cut, made from the lower jaw of a skull in the writer's possession, shows the teeth of an ancient mound builder, a Malkelkos Indian. The well-worn appearance of the teeth affords sufficient evidence of the thoroughness with which they were used in the grinding of acorns and cereal foods, the staples eaten by the aborigines.

A most interesting fact, brought to light by X-ray studies of the intestine made by Hurst of London and by others, clearly shows the great importance of thorough mastication and deliberation in eating. The chewing of food apparently stimulates the colon to action through what is known as the gastrocolic reflex, so that after each meal there is a mass movement in the colon that Hurst describes as "a powerful peri-

staltic wave that moves rapidly along a considerable length of the bowel carrying all the contents before it." By this mass movement, the contents are carried down to the pelvic colon where they remain until the next meal, when another mass movement is set up that carries the fecal matters from the pelvic colon into the rectum, thereby giving rise to the "call" which is Nature's demand for an opportunity to be rid of the wastes.

It is evident that the chewing of food is an important means of setting up in the colon the movements necessary to push forward its contents toward the outlet. When food is swallowed in a hasty manner, the colon may not receive the amount of stimulation required for efficient action, and as a result the intestinal contents may not be near enough to the outlet of the colon to insure evacuation after the following meal.

Excessive chewing of the food, to which the term "bradyphagia" has been applied, has been charged with being a cause of constipation. The charge is unjust. One who follows the instructions of Fletcher, to swallow nothing that cannot be reduced to liquid in the mouth, will suffer from the insufficient bulk but not from the mastication.

Food should be chewed sufficiently, that is, until the tongue no longer discovers coarse particles, but the excessively prolonged chewing



Lower Jaw of Mound Builder

advocated by Fletcher is unnecessary, and was not practised by him except for experimental or exhibition purposes. He habitually ate soft food, which required little chewing. In consequence, his teeth decayed rapidly. He was constantly constipated, and suffered greatly from intestinal toxemia.

The Laxative Properties of Foods

In the dietetic treatment of constipation, it is necessary to understand the particular properties of foodstuffs to which stimulation of the intestinal movements is due, and to make use of these several qualities as they may be required in individual cases. This is by no means a simple matter. It requires, first, a very thorough knowledge of food values, and second, a most thoroughgoing investigation of each individual case, so that not only the particular form of constipation from which the patient is suffering may be fully known, but also at what point or points in the intestinal tract the delay occurs.

The properties of foodstuffs to which a laxative influence is due may be briefly enumerated as follows:

1. Sapid qualities, that is, flavor and palatability.
2. Bulk or roughage, that is, the presence of cellulose, which is capable of forming an indigestible residue.
3. Moisture, that is, a necessary amount of

liquid taken at meals or between meals, especially in connection with cellulose, which by absorbing water holds it in the intestine.

4. Chemical properties that result from the presence of sugars and organic acids in the food, including the sugars formed by the digestion of starch and the lactic acid formed by protective or aciduric bacteria in the intestine. Fats are also somewhat laxative.

Flavor

Pavlov has shown the importance of taste in causing digestive activity. According to his experiments, the activity of the stomach begins almost immediately after food is taken into the mouth, and the intensity of the gastric activity depends upon the degree of stimulation of the gustatory nerves. Cash has shown by experiments on dogs that even the smell of food produces peristaltic activity.

In order, then, that the two prime purposes of eating—namely, the nourishment of the body, and the evacuation of poisonous material—may be efficiently accomplished, it is necessary that the food be so inviting and stimulating to the palate that the digestive activity is prompt and vigorous.

A meal taken without relish and eaten as a mere matter of routine and duty does not accomplish this. A person who eats without appetite is usually constipated.

The bill of fare should be so varied from day to day and from meal to meal, and the food should be of such a character, that each meal is taken with keen relish. This is especially important for persons whose lives are sedentary, and who on this account are more liable to suffer from loss of appetite, and from the constipation that is both a cause and a consequence of this difficulty.

Bulk

The writer once asked a celebrated Vienna professor, "What do you do for constipation?" The reply was, simply, "Diet." "But, professor, what do you do for cases in which diet and all other means have failed?" The reply was, "Diet, only diet." In explanation, the professor added that more bulk was the thing most needed, and that more and more bulk should be added daily until the bowels were made to move.

The alimentary canal of man, while not so long in proportion to his size as that of the herbivorous animals, is much larger and longer than in animals that habitually feed upon a flesh diet. The human intestine is approximately ten times the length of the body, that is, of the trunk, which is approximately half the height. The colon is sacculated like the colon of herbivorous animals, and like that of the higher apes, indicating the adaptation of the intestines to bulky food.

The intestine has two special senses, the muscular sense, which it possesses in a very high degree, and a fine tactile sense, located in its mucous lining. The muscular sense is excited by distention, which causes tension of its muscular walls.

Foods that are completely digested and absorbed by the intestine, leaving little or no residue, do not, therefore, encourage peristalsis or intestinal activity. This is the reason why rice, boiled milk and fine-flour bread have become generally known as constipating foods. These foods are not actively constipating; they simply do not leave sufficient indigestible residue to afford the necessary bulk for promoting mechanical stimulation to the intestine.

To obtain bulk, fowls swallow feathers and sand. Horses sicken when fed on corn alone because of the fact that corn is largely absorbed in digestion and leaves little residue for the stimulation of intestinal movement. They must have a liberal supply of coarser material to make up bulk.

A Maine ship captain saved a cargo of mules, when his supply of hay was swept overboard, by feeding them shavings made by the ship's carpenters. A number of horses in the cargo refused to eat the shavings and died. In England, when the price of grain is high, the farmers feed their stock treacle combined with wood sawdust, and with good results.

White bread and other fine-flour products are most unwholesome, not only because they are lacking in essential vitamins and food minerals, but because they are constipating. The bran of wheat is one of the most valuable of all forms of roughage or bulk.

All vegetable foods contain more or less cellulose, which furnishes bulk in the food residues.

The desire for green things that almost everyone experiences in the early spring, when the oncoming heat reduces the amount of the food by lessening the appetite, is an instinctive prompting that cannot be disregarded without injury. A western pioneer, who was shut up in the mountains of the Coast Range by an early fall of snow and confined for three months with several companions and a number of mules with no food but corn meal, escaped without injury, although his associates all suffered extremely, by following the example of the mules, which dug tunnels in the fifteen-foot snow drifts and ate the grass hidden underneath.

A diet consisting largely of meat, eggs, milk, cane sugar and fine flour bread, leaves little or no residue, or bulk, to act as a stimulus to the colon muscles. In general, all animal foods encourage constipation, for the reason that they are very completely soluble in the digestive fluids and thus furnish little roughage or bulk for the colon. Hair, feathers and bones are al-

most the only animal tissues not capable of complete solution in the digestive juices. It is in part for this reason that carnivorous animals usually eat bones with the flesh on which they feed. The bones are of course necessary also for the calcium that they contain and that is almost wholly lacking in the soft tissues of animals that are used for food.

Many carnivorous animals also eat more or less vegetable food, and thus obtain bulk in their dietary. Cats and dogs often nibble grass and special weeds, of which they appear to be extremely fond.

It is evident, also, that if the bulk of the food taken is small, the pelvic loop may be so long a time in filling that the feces that first enter will become dry and compact and form a mechanical obstruction. Thus the onward movement necessary to reach the rectum will be prevented, even though the bowel may rise and the gate that guards the entrance to the rectum may open.

Every meal must, therefore, contain foods that will leave a sufficient bulk in the residue to prevent stagnation in the colon. To neglect this fact on a single occasion may, in the case of a constipated person who by careful attention to his regimen has established regular bowel habits, cause the return of all the old conditions.

Sansum enumerates six groups of foods that are almost completely digested, and that constitute the diet upon which people today are living: (1) Meats, including fowl, fish and shell

VEGETABLES

Grains
per ounce

Dried Beans	40.	██████████
Dried Peas	28.5	██████████
Lentils	20.	██████████
Green Peas	9.35	██████████
Cabbage	9.2	██████████
Parsnip	8.65	██████████
Brussels Sprouts	7.85	██████████
Kohlrabi	7.75	██████████
Celery	7.	██████████
Turnip	6.6	██████████
Pumpkin	6.1	██████████
B. Potato	5.45	██████████
Beets	5.25	██████████
Asparagus	5.2	██████████
Carrots	4.9	██████████
Spinach	4.65	██████████
Cauliflower	4.55	██████████
Tomatoes	4.26	██████████
Green Peas	4.	██████████
Cucumber	3.9	██████████
Lettuce	3.65	██████████
Onion	3.55	██████████














FRUITS

Grains
per ounce

Huckleberries	61.5	██████████
Red Raspberries	37.	██████████
Blackberries	25.	██████████
Cranberries	25.	██████████
Currants	23.	██████████
Figs	22.5	██████████
Gooseberries	17.5	██████████
Pears	15.	██████████
Apricots	12.5	██████████
Prunes	10.	██████████
Cherries	10.	██████████
Strawberries	10.	██████████
Oranges	10.	██████████
Plums	7.5	██████████
Grapes	7.5	██████████
Raisins	7.5	██████████
Stewed Raisins	7.4	██████████
Peaches	5.	██████████
Apples	5.	██████████
Bananas	.3	██████████

Diagram Showing Proportion of Cellulose in Some of the Common Vegetables and Fruits

CEREALS

	Grains per ounce	
Bran	200	
Oatmeal	44.	
Barley	20.	
Rye	15.	
Wheat	10.	
Corn Meal Corn Flakes	10.	
Graham Flour Granola	10.	
Rolled Wheat	9.	
Graham Bread	6	
Wheat Grits Whole W. Bread	1.	
Unpolished Rice	.75	
Polished Rice	.4	
Fine Flour	.3	

DIETS






Normal Diet - Fruit, Green Vegetables, & Graham Bread	
Oatmeal Cracked Wheat	
Ordinary Mixed	
White Bread and Milk	
Meat	

Diagram Showing Proportion of Cellulose in Some Common Foods

fish; (2) eggs; (3) milk and milk products such as butter and cheese; (4) sugars and starches; (5) fats and oils; (6) refined cereals, white flour and the products therefrom, such as bread and pastry. The consequences of a diet composed of these foods, which are almost completely digested and absorbed, are inevitable. The deficiencies in vitamins in these foods also operate as a causative factor in intestinal stasis.

Foods particularly rich in cellulose are such fruits as apricots, blackberries, cherries, figs, grapes, huckleberries, pears, prunes, raspberries and strawberries, such grains as whole wheat and whole rye, cracked wheat and sterilized bran, and such vegetables as asparagus, beans, Brussels sprouts, cabbage, celery (raw), kohlrabi, lentils, parsnips, peas and turnips.

Whole-grain cereals also constitute a rich source of vitamin B, which is a necessary factor in the maintenance of appetite and the prevention of gastrointestinal stasis.

Pasty cereals, such as oatmeal mush, are very often decidedly constipating because of their soft consistency and consequently the little mastication that they receive. New bread, hot biscuits, noodles and doughy foods of all sorts are likewise objectionable.

The free use of fresh fruits, greens and salads of lettuce, cabbage and other uncooked foods fresh from the garden, is essential to healthy intestinal activity.

Fasting Harmful

In a state of absolute fasting, the intestine is in complete inactivity. The normal stimulus of food is lacking, and there is nothing to call forth the rhythmical activities that accompany normal digestion.

This fact is too often overlooked in the care of surgical patients, and in the treatment of obesity and of gastric and duodenal ulcer, as well as of other conditions in which the intake of food is suspended or reduced.

Fasting, which is sometimes prescribed as a remedial measure, necessarily leads to constipation, unless some preventive method is adopted. In such cases it is highly important that the colon be washed out thoroughly by an enema twice every day. Washing out of the colon can do nothing more, however, than remove materials that have been deposited in it from the small intestine; and, in fasting, the small intestine as well as the stomach is in a state of complete inactivity. Meanwhile, bile, the secretion of which is continuous, and which is six times as poisonous as the urine and therefore should be discharged promptly, also mucus and other poisonous secretions, as well as poisonous excretions from the blood, are accumulating from day to day, and there is no peristaltic movement to carry them onward because no food is taken into the stomach.

From these facts it is evident that absolute

fasting, except when made necessary by some exigency, is not likely to prove beneficial. In starvation, no "call" for evacuation appears because there is nothing with which to fill the pelvic loop and open the rectal gate.

Such foods as soups, gruels, porridges and purées contain so little solid matter that the bulk, considerable though it may be when the food is eaten, is soon reduced to a very small volume. On this account liquid foods are almost always constipating. The only exceptions are those liquid foods that contain much sugar, acids or fats.

In feeding the sick, the mistake is not infrequently made of feeding exclusively liquid or bland foods, with the idea that such foods tax the digestive organs least. In a sense this is true, but the importance of maintaining proper bowel action is so great that this must be considered in prescribing a diet for the sick. In fact, nurses, and perhaps physicians also, sometimes unwittingly do their patients great harm by restricting the diet to bland or liquid foods, which are often taken without relish, and which, on this account, as well as from lack of bulk, tend in the highest degree to promote intestinal inactivity and obstinate constipation. The conventional "tea and toast" régime is about the worst diet that could be offered a sick person. The panadas, puddings and "slops" of various sorts are little better. Many a patient owes the begin-

ning of his constipation to such a course of dieting during a temporary illness.

Milk, which has been so much relied upon as a sick-room diet, is particularly objectionable in a considerable number of cases, and should be much less freely used. Buttermilk is preferable, because of the lactic acid it contains. Its value is greatly increased by the addition of lactose.

Wheat meal porridge, or a porridge of corn meal or oatmeal, with the addition of wheat bran, is an excellent soft diet.

The acids of fruits and vegetables—citric, malic and tartaric—are mild laxatives.

The tomato, a vegetable fruit, is a most excellent stimulant of intestinal action. When possible, the tomato as well as other fruits should be eaten raw, to obtain the best effects.

Fruit juices of all sorts are most suitable for almost all forms of sickness. They contain choice nutriment in a form needing no digestion, ready for immediate absorption and assimilation.

Orange juice or freshly expressed juice of apples, grapes or other sweet or sub-acid fruit, is ideal nourishment for the sick. In the absence of these fruits, dried fruit, soaked long in water, may furnish a very fair substitute. Canned fruit juices come next in value. To these, rice or some other cereal food may be added in proper amount, also beta-lactose (B-Lac).

Roughage in the form of lettuce, celery,

purées of fresh vegetables such as turnips, carrots, tomatoes, and especially spinach and other greens, is particularly useful and is seldom contraindicated.

With rare exceptions the patient will perfectly well tolerate simple salads, stewed fruit of some sort, whole wheat preparations, especially wheat flakes in which the whole grain is represented, and even cooked bran. The danger from the use of solid food in these cases is largely imaginary, if care is taken to exclude meat, fried foods and indigestible combinations. Thorough chewing of the food is of course essential.

The dietaries generally prescribed in certain forms of chronic disease, and considered to be essential, are often highly constipating. This is particularly true in the treatment of diabetes.

In the dietetic treatment of hyperacidity, and especially of ulcer of the stomach and of the duodenum, the usual prescription is of such a character as to cause constipation, which in turn leads to intestinal toxemia and to a relapse later on.

It is true, of course, that consideration must be given an irritated condition present, but this does not exclude such efficient accessories as agar-agar, psyllium seed and mineral oil.

Number and Size of Meals

In very many cases of chronic constipation, the colon, and especially the cecum, has become

so dilated that it is seriously crippled. Its thin, atrophied walls are unable to handle large masses of material. In such cases, large bulky meals are liable to overweight the cecum and to form an impaction that may remain for days, giving rise to fermentation, also putrefaction, distention of the colon with gas, colic pains and great inconvenience. Complaint is often made that bulky foods cause much flatulence and distress, and seem to increase the constipation. The remedy is not to be found in discarding "coarse vegetables" or other bulky foods, but in taking smaller and more frequent meals. By this means the amount of material present in any portion of the bowel at any particular time will be reduced.

The proper eating program in a case of this sort is to take two principal meals and two minor meals. The principal meals should contain the chief part of the nutriment. The minor meals should make small demands upon the digestive organs. No fats should be taken at the minor meals, nor any food requiring more than two hours for gastric digestion. It is best to confine the minor meals to fruit and roughage.

The bulk should be about the same for each of the four meals. The cellulose may be taken in the form of Fig-Bran, psyllium seed, bran mush, bran cakes, colax (Japanese seaweed or Ceylon moss) or Laxa (sterilized bran and agar-agar). Any sort of fresh juicy fruit may

be eaten, but bananas, dates, dried figs and raisins should be avoided. Fresh figs or soaked raw purple figs are excellent.

Water-Drinking Helpful

Most persons who suffer from constipation habitually drink too little water. Women drink less than men. It is difficult to account for this scanty use of a necessity of life which costs little and is of such inestimable value to the body.

Water is far more immediately necessary for the support of life than is food. A man may live six weeks or two months without tasting food in any form, but a few days at the most is the limit of human life without water.

One consequence of a scanty use of water is abnormal dryness of the residues, which delays their passage through the lower colon, and often causes an actual stoppage in the pelvic colon or the rectum.

Persons who sweat much, either as the result of hot weather or vigorous exercise or hot baths, are liable to suffer from constipation unless special care is taken to supply the body with water sufficient to make good the loss. The skin ordinarily throws off as perspiration an ounce and a half of water each hour, or more than a quart in twenty-four hours. If active exercise or sweating baths are indulged in, this amount may be increased to thirty or forty ounces in an hour. The kidneys excrete two to three pints

daily. It is evident, then, that care must be exercised to replace the water that is lost through the skin and kidneys.

Scanty and highly colored urine is an evidence that the tissues are in need of water. Dryness of the skin often testifies to the same need.

In diabetes there is a great loss of water through the kidneys. This, also, must be replaced by drinking.

Meat eaters, because of the burden of the high protein of meat on the kidneys, as well as those who use salt freely, require a much larger amount of water than do those who adhere to a low-protein dietary and who use little salt.

Children, as well as adults, need much more water than they are usually given.

The average person should take a couple of glasses of water on rising, and the same amount before retiring at night. A glassful should be taken an hour before both dinner and supper, and an equal amount two hours after eating, or a total of at least two or three pints a day. Young children need half as much as adults.

Water should be taken in proper quantity irrespective of thirst. It may be made palatable by the addition of fresh fruit juices.

The free use of oranges or orange juice, and of other juicy fruits, serves the same purpose as water-drinking, to the extent of the liquid that they supply.

Tea and Coffee Harmful

Tea and coffee contain two substances the poisonous effects of which are well known, viz., caffeine, a nerve poison practically identical with uric acid, and tannin, an astringent well known as one of the constituents of oak bark and many other vegetable substances.

Everyone is familiar with the use of astringent or tannin-containing remedies in diarrhea. However beneficial tannin may be in cases in which the bowels are abnormally active, certainly its effects are nothing but pernicious when used habitually.

Vitamins Needed

McCarrison has clearly demonstrated that vitamins encourage intestinal activity, particularly the vitamin B. The so-called "constipating foods" are lacking in this highly essential food principle. It is abundant in wheat bran and wheat germ but lacking in fine-flour bread, new-process corn meal, cane sugar, polished rice, and in fact a large number of prepared foods.

Lack of appetite is in many cases the result of deficiency of vitamin B, which not only stimulates appetite and digestion through promoting the secretion of gastric juice, but energizes the intestine and so promotes normal bowel action. Nearly every vital process is more or less dependent upon vitamin B, and the whole body suffers when this element is deficient. Care must

be taken to make free use of foods rich in vitamin B, such as bran, greens and Savita (yeast extract).

While it is true that the cooking of food in general increases digestibility, experience in the feeding of both infants and adults has clearly shown that a diet consisting exclusively of cooked food is detrimental both to digestion and to general health, and may lead to the most serious results, because of the fact that cooking greatly injures or destroys some part of the vitamins which are so essential to good nutrition.

Some raw foods should, therefore, be taken every day, or preferably at every meal. Among foods of this kind especially to be recommended are fresh fruits of all sorts, melons, carrots, tomatoes, green corn fresh from the garden (uncooked), celery, lettuce, cabbage, turnips of the best varieties and cucumbers.

Raw foods must be very thoroughly chewed, as otherwise they may cause too long delay in the stomach. The universal relish for fresh vegetables is an evidence of their value.

Sugars

All the sugars stimulate intestinal activity. Roger thinks this action is confined to the small intestine, but in this he is in error, for every abdominal surgeon knows the remarkable laxative effects of an enema consisting of a half pint of molasses with an equal amount of hot water.

Cane sugar is undesirable, however, because of its irritating effects. The sugars of fruits—levulose and dextrose—are wholesome and efficient. The malt sugar produced by the action of the saliva upon starch is of great service as a stimulant of gastric and intestinal activity. Many mothers know the laxative effect of malt sugar added to the infant's food.

Lactose, or milk sugar, is to some persons, especially children, decidedly laxative, even in doses of only two or three dessert-spoonfuls taken daily before breakfast. Lacto-dextrin is a highly valuable laxative through its efficiency in changing the intestinal flora; it causes the fermentative or acid flora to become dominant, and the acids thus formed stimulate peristalsis.

A new form of lactose recently made available, beta-lactose (commercially known as B-Lac), is three times as soluble and more than three times as sweet as ordinary lactose, so that it very satisfactorily replaces cane sugar for table use. Two or three heaping dessert-spoonfuls of this beta-lactose taken at each meal will combat constipation by acidifying the colon contents.

Condiments Constipating

Mustard, pepper, pepper sauce, cayenne, capsicum, horseradish and the whole list of hot, irritating substances that are frequently added to food as seasoning, having no food value in themselves, are active causes of constipation.

The concentrated residues of the foodstuffs, including the indigestible particles of mustard, pepper or other condiment taken with the food, brought in contact with the rectum cause chronic catarrh. Hemorrhoids develop together with ulcers, fissures and abscesses, followed by fistulae, and the way is prepared for tuberculosis and cancer.

In India, especially in Ceylon, and also in Mexico, countries in which curries and hot, peppery sauces are used, gastric catarrh, constipation and hemorrhoids are almost universal among those addicted to the use of these pernicious food-poisons.

Effect of Tobacco, Alcohol and Other Narcotics

Numerous laboratory experiments have shown that the use of tobacco in any form has a paralyzing effect upon the splanchnic nerves. Normal rhythmical bowel movements are impossible without the aid of these sympathetic nerves. The fact that some persons observe an apparently favorable influence from smoking is accepted as evidence that the effects of the weed are favorable to the bowels. These cases are exceptional.

In general, the use of tobacco is highly injurious to the intestine. Kreuznach of Vienna has shown that nicotin produces arteriosclerosis of the splanchnic vessels. That is, it produces

hardening and degeneracy of the vessels that supply the colon and other abdominal organs. This change in the blood vessels gives rise to degeneracy and atony, and hence to constipation, by which it is always accompanied.

Alcoholic beverages of all sorts tend to produce constipation, by causing chronic intestinal catarrh, gastritis, duodenitis, ulcer of the stomach and paralysis of the sympathetic nerves.

Opium in all forms produces a specific effect in paralyzing the bowels. In former times it was customary to administer opium in sufficient doses in certain cases to cause complete inactivity of the bowels for a week or more. In such cases the constipation induced was often the beginning of chronic constipation of a most obstinate character. The very common use of opium for the relief of pain is a prolific cause of constipation, especially among women. The fact that a laxative drug is generally given to overcome the constipating tendency does not prevent the evil that results; it only adds another.

Bromides and sleep-producing or hypnotic drugs of all sorts tend to produce constipation, although some of them are less harmful than opium. Fortunately, the use of these drugs usually may be dispensed with when the resources of hydrotherapy and other physiological means are employed.

THE NORMAL OR ANTITOXIC DIET

The first thing essential for maintaining a normal intestinal flora is a normal diet. In the stools of nursing infants the aciduric flora is dominant for the reason that woman's milk contains 6 per cent of lactose, and the curds of woman's milk are soft and flocculent and so easily digested that they seldom reach the colon. Hence the proportion of carbohydrate to protein in the colon is large, the aciduric germs thus having favorable conditions for growth and readily becoming dominant.

When the diet of the infant is changed from milk to meat and cereals, the aciduric flora largely disappears and *C. Welchii*, *C. butyricum*, *B. proteus* and *B. coli* become dominant.

With the average diet and the increase of years, the dominance of putrefactive organisms increases, as shown by Herter, until in advanced age the Gram stain may show a flora consisting of 90 or 95 per cent of "wild" bacteria, largely "meat" germs. The flora of senility is, however, often encountered in persons who are highly toxic no matter what their age.

Uncooked Foods

Man is the only "cooking animal." To primitive man cookery was not only unknown but as unnecessary as for any other member of the

animal kingdom. The only really valuable purpose served by cookery is to enable man to make use of dried grains and certain coarse vegetables, which would otherwise be unavailable as food.

Food is often by cookery deprived of certain elements that are essential to human nutrition. Cookery destroys the life of the cells of vegetable foods, and in so doing deprives the food of certain properties that are useful in the intestine, for the reason that living cells resist the attacks of microorganisms. A raw apple or potato remains intact for months, while a cooked apple or potato is in a very few days covered with mold and in an active state of fermentation and destructive change. Living cells resist germs.

An experiment made by the writer some years ago gave very positive evidence of this fact. Two equal portions of cabbage were taken. One portion was cooked. Both portions were then inoculated with equal quantities of putrefactive bacteria by mixing with each a portion of fecal matter. The two portions of cabbage were then placed for three days in an incubator in which a temperature of 100° F. was maintained. Examination showed that the germs in the cooked cabbage had increased enormously in numbers, whereas in the uncooked cabbage the number of germs had not increased but had actually diminished. Recent experi-

ments have shown that colon germs rapidly disappear in a medium consisting of raw cabbage juice and distilled water. Such a preparation becomes sterile within three or four days if care is taken to avoid contamination with molds.

Many persons have thought themselves benefited by the use of raw grains, such as wheat and oatmeal. While it would be impossible for a person to live on a diet consisting exclusively of raw grains, it is possible that some benefit may be derived from the use of such food, to a moderate extent, through the fact that uncooked starch digests slowly. Cooked starch, as well as sugar and other carbohydrates, is normally wholly absorbed in the small intestine, or practically so, and therefore furnishes no resistance to the growth of bacteria; but raw starch, if taken in more than minute quantities, as the writer has shown by experiment, finds its way into the colon. Here, digestion proceeds slowly, producing dextrin and sugar, which furnish to the acid-forming bacteria just what they require for their growth in a section of the intestine where the help of these friendly organisms is most needed.

Primitive man's dietary comprised foods containing a sufficient amount of raw starch to prevent extensive putrefaction in the colon. The art of cookery, while essential under the conditions of modern civilization, is not altogether free from disadvantages. These disadvantages

may easily be obviated, however, by a proper selection of foods, or, in special cases, by including in the bill of fare partially cooked foods containing a certain portion of uncooked starch, such as oatmeal or other grains cooked six to ten minutes.

The effects of raw foods upon the flora are highly beneficial. This is the reason for the success of the "fruit regimen," as previously explained. They are highly acceptable in an uncooked state, both to the palate and to the digestive organs. They are completely prepared for human sustenance in the great laboratory of Nature—"cooked in the sun," as people say in Mexico. With very rare exceptions, fruits contain a considerable amount of organic acids—citric, malic or tartaric—all of which possess anti-toxic properties. Even many sweet fruits contain a considerable amount of these acids, which are disguised by the sugar but which are not neutralized or destroyed by it. The sugars of fruits promote to some degree the growth of acid-forming bacteria in the intestine, and thus lead to the formation of lactic acid, which, like the acids of fruits, is anti-toxic. The free use of fresh, ripe, uncooked fruit is, therefore, very helpful in maintaining a good flora. Apples, berries of all sorts, fresh figs, plums, peaches, melons, tomatoes are all excellent.

Attention was especially called by Herter to the fact that, in the use of uncooked fruit,

great care must be taken to wash the fruit, and to avoid the bacteria found on the surface. Among the organisms with which fruits are frequently infected are the *C. butyricum* and the bacillus of malignant edema, two exceedingly pernicious organisms. Rettger found them to be very abundant on the skins of bananas.

All foods that are exposed to contamination and that are served without cooking should, therefore, be carefully disinfected by immersion for five minutes in a chlorid of lime solution, prepared by the addition of one heaping teaspoonful of fresh chlorid of lime or hypochlorite of soda to one gallon of water. This precautionary measure is a protection against animal as well as vegetable parasites, and if systematically employed will lessen the number of cases of typhoid fever, diarrhea, dysentery and other intestinal disorders of mysterious origin.

A Meatless Regimen

Of the three essential food elements, carbohydrates (starch, sugars and dextrins), fats and proteins, the proteins only are capable of undergoing putrefaction. According to Nencki, MacFayden and other investigators, not less than one-seventh of the total amount of protein eaten undergoes putrefaction in the colon.

The more protein in the diet, the more protein will be found in the colon residues, and therefore the greater will be the tendency to

putrefaction. Müller and Ortweiler showed that a meat diet, which is rich in protein, increases putrefaction. Mester showed that "high" or tainted meats made the stools much more putrid than fresh meats. A mixed or flesh diet supplies, therefore, food for enormous numbers of putrefactive germs, which in decomposing the proteins produce alkaline substances—ammonia and various other toxins. A Thanksgiving turkey dinner may give rise to a severe attack of intestinal intoxication, indicated by vomiting, diarrhea, headache, coated tongue and depression.

The explanation of these cases is to be found in the constant presence in the colon of putrefactive organisms, such as *C. Welchii* and *C. butyricum*. So long as the amount of protein in the food is small, it is so completely digested and absorbed that the amount reaching the colon to be acted upon by these putrefactive bacteria and converted into toxins is too small to produce any considerable degree of injury; but when the intake of protein is considerably increased, the quantity of toxins produced is more than the body is able to deal with and ill effects appear. Overeating also leads to autointoxication by supplying to the colon an unusual amount of unabsorbed material.

Vegetable proteins stand in strong contrast to animal proteins, especially meat, in that they do not offer the slightest encouragement to the

growth of putrefactive types of intestinal bacteria, according to Torrey, the professor of bacteriology at Cornell University. Herter called special attention to the fact that the intestinal contents of carnivora contain many more putrefactive, spore-bearing bacteria than is the case with the herbivora.

Newburgh of the University of Michigan has recently demonstrated by feeding experiments that lean meat contains highly poisonous substances known collectively as "non-protein nitrogen." This material, when fed to rats, produces nephritis.

The writer's personal experience with a low protein, meatless dietary for over 60 years has convinced him of its adequacy and superior wholesomeness. In fact, since man belongs biologically to the great family of primates and is the highest type of this order of animals, it would seem to be perfectly safe for him to make use of the same foodstuffs as do other members of the primate family. None of the big apes are meat eaters. They can be taught to eat meat, as does man, but they thrive much better without it, and in their natural state eat meat only when forced to do so by the absence of other food.

These suggestions are offered only as evidence that disuse of flesh foods as an essential means of accomplishing a thoroughgoing change of the intestinal flora is a perfectly safe and practical procedure.

Combe showed that there is little putrefaction when carbohydrates constitute as much as five-sixths of the total food intake. Such a dietary is possible, since Chittenden has shown that 10 per cent of protein is ample, and Hindhede has demonstrated that a man may remain in good health for months on a dietary from which fat is altogether excluded. Foods rich in starch and sugar do not undergo putrefaction either outside the body or within the intestine, and hence are properly termed atoxic foods.

When considerable quantities of starch are present in the colon with very little protein, as in a vegetable diet, acid-forming bacteria are more numerous and the feces have an acid or neutral reaction.

Backmann showed that eggs, when freely used, also increase putrefaction in the intestine, but much less so than do meats. Salkowski, fifty years ago, showed that egg albumin greatly increases putrefaction in the colon. When whole eggs are freely eaten, especially if hard boiled or poached or in the form of an omelet, portions of undigested albumin may always be found in the stools, and in a state of advanced putrefaction. Egg yolks are less objectionable than the whites, being more easily digestible. For changing the intestinal flora, in many cases it is wise, therefore, to avoid eggs or at least to use them very sparingly.

Those who have been accustomed to the free

use of meat and eggs are sometimes afraid to dispense with them lest they suffer from an insufficient supply of protein. That the protein requirements of the body may be fully supplied by a diet from which meat is wholly excluded, and that even eggs as well as meat may be dispensed with, provided half a pint of milk is used daily in connection with other foods, has been shown conclusively by the extensive practical experience at the Battle Creek Sanitarium and by the experiments of Chittenden at Yale. Also, the sufficiency of a diet of this sort has been definitely proved by the experiments of Sherman of Columbia University, on both animals and human beings. Torrey of Cornell University found that milk casein as an article of diet exhibited far less tendency to give rise to intestinal putrefaction than did meat protein.

The late Dr. Stephen Smith, who lived to the age of more than 99 years, told the writer on several occasions that he attributed his remarkable longevity very largely to the fact that during the first 60 years of his life a tendency to looseness of the bowels compelled him to restrict his food almost absolutely to bread and milk, a most excellent dietary for the cultivation of an aciduric flora.

Herter called attention to the fact that cheese commonly contains large numbers of putrefactive bacteria, and remarked, "Cheese is therefore an article generally to be excluded from

the dietary of nearly all cases of excessive chronic intestinal putrefaction."

Cheese freshly prepared from clean milk, cottage cheese, is, however, permitted. Schmitz showed that fresh cheese, especially cottage cheese, had a marked effect in lessening putrefaction. He thought that the beneficial effects of cheese were due to casein, but found later by experiment that when the lactose was removed from the cheese, putrefaction was increased.

When Milk is Not Tolerated

It is possible to arrange an adequate bill of fare with the exclusion of milk, provided nuts are used freely. Nut protein resembles the protein of milk, in its dietetic properties, and is even more resistant to putrefactive changes. Peanuts, walnuts and almonds are rich in protein of superior quality. A pound of pine nuts, in fact, contains 50 per cent more protein than a pound of lean beef, besides which it contains twice as much additional nutriment in the form of an easily digestible fat. Practically the same thing may be said of almonds and peanuts. Any possible deficiency in protein may readily be made up, therefore, by taking at meals a handful of any kind of nut meats.

It is highly important to remember that nuts must be very thoroughly masticated, so that the protein present may easily be accessible to the digestive juices.

Various nut preparations, nut butters, nut creams, etc., are also available. Peanut butter, which was the result of experiments undertaken by the writer to increase the digestibility of nuts so that they might replace meat in the bill of fare, has now come into such general use that it may be found in every grocery store and in nearly every pantry in the land.

A nut product known as *protose*, consisting of nuts and the gluten of wheat, very closely resembles meat in its chemical composition and to some extent in appearance and flavor. This preparation was produced as the result of a request made of the writer many years ago (1899) by the Assistant Secretary of Agriculture, Doctor Dabney, for a vegetable substitute for meat, in view of the fact that the rapid settlement of the free pasture lands of the West was likely in the course of a few years to render meats scarce and high in price. Protose has proved sufficiently satisfactory as a meat substitute to necessitate its production in commercial quantities.

Meat as Eaten Teems with a Putrefactive Flora

It is well worth while to keep in mind the fact that fresh meats, including fish and oysters as served, are fairly reeking with the very kind of bacteria that we are seeking to eliminate by changing the flora. All meats are infected with colon germs in the slaughterhouse. The aseptic

rules of the operating room are not observed in the abattoir. The skins of slaughtered animals are always soiled with colon germs. In the processes of skinning and dressing, the raw flesh is thoroughly inoculated with colon bacteria, which rapidly penetrate the warm tissues and within 24 hours are swarming in every part of the animal's carcass. A piece of flesh taken from an animal just killed, and placed in a tightly sealed container, will be found in a few days in an advanced state of putrefaction and teeming with colon germs (Tissier). As the meat is hung to "ripen" for use, the bacteria develop until in prime beef and even in fresh meats as usually sold colon germs are present in appalling numbers.

If meat is to be eaten, it should be taken in a perfectly fresh state as the old Mosaic law required. The process of so-called ripening of meats is nothing more nor less than slow putrefaction.

Handbooks on meat inspection point out the fact that fresh meats contain anywhere from 1 to 30 million bacteria per gram, but it does not mention the fact that these bacteria are of the same sort as are found in fresh manure.

Roderick, in a recent research, found in specimens of various sorts of meat bought over the counter at several different markets, *C. Welchii* and other putrefactive bacteria in great numbers. The following bacterial counts were found

in meats which to the eye and the sense of smell gave no evidence of being decomposed, but which like all fresh meats were evidently in a state of putrefaction:

	BACTERIA PER GRAM*
Beefsteak	1,250,000- 1,500,000
Pork chops	170,000- 2,900,000
Corned beef	100,000-31,000,000
Beef liver	10,000-31,000,000
Hamburger steak	180,000-75,000,000
Pork liver	100,000-95,400,000
Oyster juice	1,000,000- 3,400,000

For comparison, examinations of the fresh droppings of various animals, and of other substances known to be putrescent, were made with the following results:

	BACTERIA PER GRAM
Calf	15,000,000
Goat	20,000,000-69,000,000
Horse	25,000,000
Cow	65,000,000-80,000,000
Limburger cheese	18,000,000
Sewage	1,100- 1,800

Ostertag tells us that School found in a two-days' old steak so many putrefactive toxins that a watery extract made at a temperature of 104° F. killed a guinea pig by paralysis in two hours.

He also tells us that in meat that had been preserved in ice for two weeks, Förster found millions of bacteria in a single milligram of the

*A gram is one-thirtieth of an ounce.

surface substance. This would mean scores of billions in an ounce of such meat. According to the same authority, Presuhn found colon bacilli deep in the substance of the liver twenty-four hours after death. Mice inoculated with the cultures died in twenty-four hours.

In papers read before a meeting of the American Public Health Association, Weinzirl and Newton presented an improved method of making bacteriological examinations of meat, and showed that butcher's meat is swarming with putrefactive bacteria long before its odor or appearance shows any evidence of decay. As many as 2,640,000,000 bacteria to the ounce were found in Hamburger steak that "would pass muster" under ordinary sanitary inspection. In only four out of forty-four samples was the number of bacteria less than 30,000,000 to the ounce, the average being more than 460,000,000. Some years ago, Marxer, a recognized authority, found that market meats that easily passed the ordinary inspection tests often contained more than 30,000,000 bacteria to the ounce.

The South American Indian poisons the points of his deadly arrows by dipping them into putrid flesh. Butchers as well as undertakers sometimes die as the result of a small cut made with a knife soiled by contact with decomposing meat.

The same poisons are produced when putrefaction takes place in the intestine, that is, when

its flora becomes predominantly putrefactive. Foods that are in a state of putrefaction when eaten, such as prime beef, game, Hamburger steak and certain kinds of cheese, will of course greatly encourage putrefaction in the intestine. Bouchard showed that the urine of mixed feeders is twice as toxic as that of flesh abstainers. Herter laid special stress upon the suppression of foods containing putrefactive bacteria, remarking, "It is clear that in such cases the greater the freedom of the food from putrefactive bacteria, the less will be the liability to putrefaction at lower levels" (that is, below the stomach).

It is true that a large part of the bacteria are killed by cooking. Certain forms of cooking, as frying, may destroy all bacteria and render the flesh sterile; but the ordinary processes of stewing, roasting and broiling do not by any means render meat sterile. Hence, in general, it is fair to say that meat tends strongly to promote intestinal putrefaction—first, because of the readiness with which meat proteins undergo putrefaction, and second, because meat contains when eaten great numbers of putrefactive bacteria, some of which produce spores which are not destroyed by ordinary cooking.

It is most essential, therefore, in attaining a normal aciduric flora, that the diet should eliminate flesh foods of all sorts, including fish, oysters, fowl, as well as beefsteaks, chops, etc.

The writer has for many years wholly discarded meats from the dietary of his patients because it seemed inconsistent to inoculate the intestinal tract with putrefactive bacteria when at the same time making efforts to suppress the growth of this class of organisms.

After the flora has been changed, the measures taken to effect the change must be continued, otherwise the old conditions will speedily return. A single digression may restore the old flora in full force. A few oysters on the half shell, a lobster salad, or even a steak or a chop that happens to be well loaded with bacteria—as all prime and tender steaks and chops are sure to be—may undo the results of weeks of effort to eliminate the “wild,” meat bacteria (Herter) and establish the normal protective flora.

Animal as well as Vegetable Parasites Abound in Flesh Foods

In recent years, attention has been called to the fact that acute infections of the colon are sometimes due to animal parasites. Certain amœbæ, flagellates, spirochetes and other forms of protozoa are also found in great numbers in the colon in cases of chronic constipation and colitis, as well as in cases of amoebic dysentery. These organisms have been regarded by most authorities as pseudo-parasites, with the exception of those of amoebic dysentery. Dr. Ronald

Ross has pointed out that all these organisms are parasitic and dangerous. If they do not set up the acute inflammation characteristic of amoebic dysentery, they bore into the mucous membrane and thus prepare hiding places for pernicious bacteria, which develop chronic infections and intestinal toxemia. Observations made a few years ago in the laboratory of the Battle Creek Sanitarium show that these animal parasites are rarely found in the stools of persons who subsist upon a non-flesh dietary. They abound in feces that are in part made up of undigested residues of flesh foods.

Animal Fats Encourage Putrefaction

Nasse observed that the free use of fats encouraged intestinal putrefaction. The over use of fats encourages the growth of *C. butyricum*, a fat fermenting microorganism, and therefore the development in the intestine of rancid, highly offensive stools—a condition designated by Herter as “butyric putrefaction.”

Backman observed that cream and butter encourage putrefaction less than do other animal fats.

Vegetable fats are in general less harmful in their influence on the flora than are animal fats.

Stefansson's Suet-Eating Experiment

Use has recently been made by the meat packers of the prestige of Stefansson, the Arctic ex-

plorer, in an attempt to convince the American people that an exclusive meat diet is harmless. Dr. C. W. Lieb, who seems to be the medical mouthpiece of the Meat Board, gave in the *Journal of the American Medical Association** what professed to be a summary of the results of the studies made.

By this report it is shown that men can live on suet with a little lean meat for several months, while surrounded with inviting fresh fruits and vegetables and other wholesome food-stuffs, if they have resolution enough and such financial encouragement as men ought to receive for lending their bodies for such an unhealthy and unholy purpose to serve the interests of a great commercial publicity bureau.

Those who supposed that Stefansson and his friend, Andersen, who also participated in the so-called experiment, had been eating daily during several months great slabs of beef, mutton, lamb, pork, etc., the picture the Meat Board was apparently trying to visualize to the public, were simply deceived. The men ate as little lean meat as possible. They lived chiefly on fat. Half a pound of suet and a few ounces of lean meat was their daily ration.

According to Doctor Lieb's report, Stefansson was fed muscle meat at first, but it made him so sick within two days that he had to give it up. Here is Doctor Lieb's own account:

*July 6, 1929.

"After preliminary studies on a mixed diet Stefansson was put on an exclusive lean meat diet for the purpose of studying the effects of an excessively high protein, minimal fat dietary. Stefansson predicted that he would be ill in a few days, judging from his past experience in the Arctic, and such proved to be the case. Although this experiment was planned for but four days, in the evening of the second day he became nauseated and developed some of the discomfort, lethargy and weakness of the knees that he experienced on an enforced lean meat diet in the North. The next day all the symptoms became intensified and diarrhea developed.

"This part of the experiment was, of course, stopped and by adding fat in tasteful quantities, he fully recovered within two days. He lost 2 Kg. [4½ lbs.] in the first ten days. Following the *acute enteritis* just described, he developed a stubborn constipation coincident with a craving for special foods, particularly calves' brains (10 per cent ether soluble substance) and bacon. He ate heartily of this combination for several meals, but this over-compensatory diet resulted in two days of nausea and severe diarrhea.

"By adjustment of the lean-fat ratio, a normal gastro-intestinal state returned, and no other diet complications developed. . . .

"Andersen did not suffer such digestive upsets as Stefansson, mainly because no all-lean (high protein) observations were made on him."

Here is a picture of the effects of a real meat diet. In only two days on a meat diet Stefansson was so sick it was impossible to continue. It was necessary to change the program. So, instead of feeding him on muscle meat, such meat as you buy at the meat shop in the form of steaks and chops and roasts, they fed him on suet; that is, fat, with a daily quantity of real meat no greater than many a man eats at a single meal. According to Doctor Lieb, Stefansson ate two thousand one hundred calories of fat and five hundred and fifty calories of protein; that is, his diet was four-fifths fat and only one-fifth muscle meat. In other words, a tallow diet rather than a meat diet.

To make it possible for Stefansson to live without vegetable foods, it was necessary to adjust his diet with great care. In spite of this he was the whole time of his experiment living close to the edge of a catastrophe. Evidently he ate all the meat he dared to eat, and that was very little.

Andersen escaped the enteritis because the Stefansson experiment was so disastrous the experimenters were evidently unwilling again to run the risk involved in a really exclusive meat diet, that is, a diet of lean meat, such as steaks and chops, roast beef and the like.

According to Doctor Lieb's report, Stefansson was so sick with influenza that he spent two days in bed and Andersen was very ill with

pneumonia. If meat has the wonderful health-promoting properties claimed for it, Stefansson and Andersen should have maintained high health during the whole experiment. The fact that one was seriously ill with pneumonia and the other with influenza shows that the vital resistance of these hardy, athletic men must have been reduced below that of the average citizen, for only a small proportion of the people exposed along with them to pneumonia and influenza suffered attacks of these diseases. The fact that both were ill shows clearly enough that their meat diet afforded them no protection as it should have done if such a diet promotes health and vital resistance, as its votaries claim.

Mention is made by Doctor Lieb of the fact that Stefansson suffered and recovered from an attack of typhoid in the wilds of the Arctic. Where did the explorer find the typhoid germs among those Arctic snows? We suspect his fever was due to the *B. paracoli*, generated in the half-rotten meat he was eating.

Doctor Lieb professes to give a very comprehensive summary of the elaborate studies made of the men who jeopardized their health to supply sensational publicity material for the Chicago Meat Board. He claims to have found no functional disturbance of any sort. The reader is left to suppose that this monstrous bill of fare, fit only for a hyena or barracuda, was absolutely harmless; that it imposed no strains upon the

vital machinery, and might be universally adopted without risk of injury. What a pretty paradise for packers that would be—everybody eating half a pound of tallow every day. And how the doctors and undertakers would flourish!

The Stefansson-Andersen-Meat-Board meat experiment turned out to be the strongest sort of proof of the *unwholesomeness* of a meat diet.

The Normal Diet Suggested by the Physiology of the Colon

All vegetable-eating animals have long colons, as has man. The presumption is that a vegetable diet requires a long colon. Meat-eating animals, such as the dog, have short colons. The frog while in the tadpole state is a vegetable feeder and has a very long colon. The adult frog feeds upon flesh and has a very short colon.

Carnivorous animals have a short alimentary canal and a smooth colon. The movement of foodstuffs along this short, smooth passage is rapid. This is necessary for the preservation of the life of the animal, as undigested remnants of meat long retained in the body necessarily undergo putrefactive changes with the production of poisons of a dangerous character.

In the accompanying plate will be seen representations of the colons of different animals.

Several authorities have reported observa-

tions on human beings that are quite in accord with the observations made of the close relation between the size of the colon and the character of the food in various classes of animals. For example, an observer reports that a certain Asiatic people, whose diet has for centuries been strictly vegetarian, have longer colons than those of the Eskimos, whose diet is almost exclusively meat.

The trouble with the civilized colon is not that it is too long but that it is put to a wrong use. Civilized man has adopted the diet of the dog while having the colon of the chimpanzee. It may be admitted that if a man is to feed on the diet of the dog he ought to have his colon abbreviated. This is, in fact, the only way in which he could avoid a dangerous biologic misfit. But it is much easier to change the diet and the flora than to change the colon.

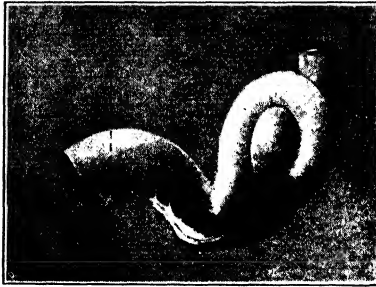
From a study of the modern hotel bill of fare, one could not possibly obtain even a suggestion of man's primitive and biologic diet. The natural conclusion would be that man is a universal feeder, since the average hotel menu presents practically everything that any animal eats. But biology teaches us that man is naturally frugivorous, and science offers no reason why he should have departed from his original bill of fare, to which his nearest relatives, the anthropoid apes, the chimpanzee, the orang-utan and the gorilla, still scrupulously adhere.



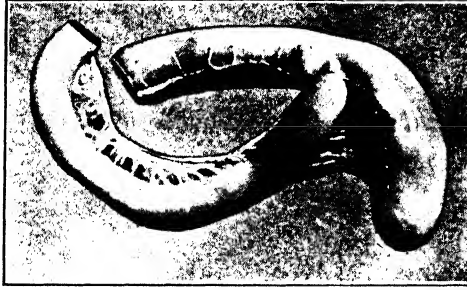
Cecum and Appendix
of a Chimpanzee



Colon of a Japanese
Deer



Cecum of a Dog



Cecum of an Opossum

SOME ANIMAL COLONS

According to Sir Arthur Keith, the eminent English anatomist, the special form and structure of the teeth of early races indicates that they were non-flesh eaters. Sir Arthur evidently believes the natural or primitive diet of man to be the same as that of other members of the great family of primates (higher apes).

IMPORTANT FOOD ACCESSORIES FOR COMBATING CONSTIPATION

The growing tendency in modern times to make use of refined and concentrated foodstuffs is undoubtedly one of the leading causes of the almost universal prevalence of constipation among civilized people. It has created the necessity for supplementing our ordinary foods with accessory substances that aid bowel action by supplying the bulk, lubrication and mechanical stimulation or titillation required to arouse the colon to efficient activity.

These food accessories are substances that, while not nutrients in a strict sense of the word, become essential dietary constituents through their ability to make good the deficiencies of the denatured foodstuffs that make up so large a proportion of our modern bill of fare.

It is to be remembered, also, that the civilized colon has become so badly crippled by long abuse that the amount of food accessories of a laxative character is much greater—in some cases perhaps two or three times greater—than would be required by a normal colon.

Drug laxatives are habit-forming; that is, when a laxative drug has been used for a time, it becomes less efficient, so that the dose must be increased. Sooner or later the drug ceases to

be effective and must be exchanged for some other laxative remedy. This is not true of laxative food accessories.

The laxative effects, from the use of these dietary aids, is not obtained by forcing the bowel to act, as in the case of drug laxatives, but by assisting the intestine in a purely physiologic way.

For Furnishing Additional Bulk

It is strange, indeed, that civilized man should be about the only creature among the members of the animal kingdom who neglects to supply his alimentary canal with the food bulk necessary to the intestine for its normal stimulus to action. In civilization, domestic animals fare better than human beings in this regard. When the horse, ox or cow loses appetite and becomes constipated, bran mash is the farmer's ready and efficient remedy. But seldom does he think of giving himself this simple and natural corrective. Instead, he dopes himself with purgative pills or mineral waters, which ruin his digestion, spoil his kidneys, increase constipation and ultimately induce colitis, one of the most common and most formidable of all the evil effects produced by an inactive colon.

Most primitive people recognize the need of bulk to maintain healthy action of the alimentary canal. Mr. George Kennan, the celebrated

Siberian traveler, stated to the writer that Eskimos eat half-digested reindeer moss as a remedy for and preventive of constipation. The moss is obtained by killing the reindeer at a certain time after feeding, removing the half-digested moss from the stomach, and submitting it to a very slight and simple preparation. Doctor Wilfred Grenfell of Labrador states that it is the custom in that country to feed reindeer moss to the sled dogs. After mixing with oil, the moss is eaten by the dogs with great avidity and they appear to thrive upon it.

The natives of Japan and China eat quantities of dried raw turnip, bamboo sprouts, lily flowers and roots, and other vegetables and greens of many sorts with the rice that forms their staple food.

The Alaska Indians gather and dry a seaweed which they use in its native state to prevent the constipation that would naturally result from the nearly exclusive fish diet on which they are compelled to subsist at certain seasons of the year. The seaweed is simply gathered and dried in the sun and pressed into large cakes between flat stones. The material thus prepared is very black in color but is crisp and not unpleasant in flavor. Natives of Peru make use of dried kelp, a common seaweed.

The Hopi Indian makes a good laxative food by grinding up in a stone mortar the whole nut of the piñon (pine), including the shell.

The Highland Scotchman escapes the constipation that would otherwise result from his diet of buttermilk, oatmeal and potatoes, by eating his brose (oatmeal) in a half raw state—simply scalded instead of boiled.

The wild Arab supplements his diet of camel's milk and dates with wheat ground in a stone mill, which supplies all the cellulose of the bran with the addition of a certain amount of pulverized stone.

The Orinoco Indians and the "poor whites" of the Tennessee Mountains combat constipation by eating considerable quantities of clay, as do horses and other animals when fed on a too concentrated diet.

Agar-Agar

The use of agar-agar is to be most highly recommended as a means of giving the necessary bulk to stimulate the intestine to prompt action.

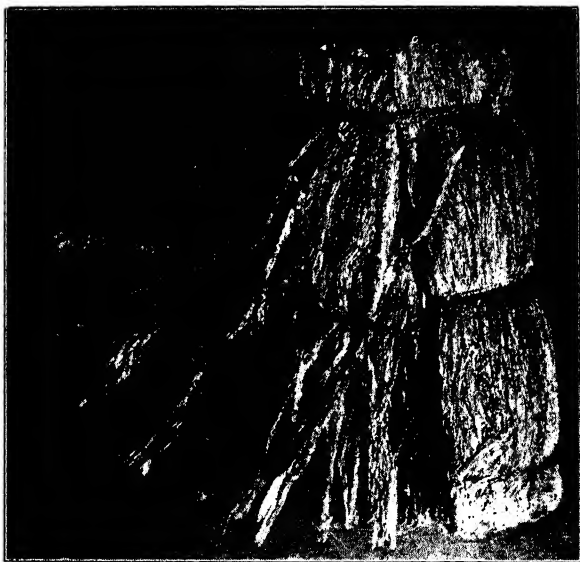
Agar is prepared from a seaweed native to the coast of Japan and Ceylon. It is sometimes known in commerce as Ceylon moss. It is also known as Japanese isinglass or vegetable gelatin. It does not, however, have the composition of gelatin. Its composition is that of cellulose. It is indigestible in the human alimentary canal.

The commercial product is prepared by cooking the seaweed with much water in large kettles, then cooling the solution, and pass-

ing the material through colanders by which it is formed into long strings. These are dried in the sun, and then bleached in the sun and dew for several weeks. The soft, watery, pulpy mass formed dries very slowly, for agar clings to water with great tenacity. This material is brought to the United States in large bales. In its original commercial form, as it is obtainable at many drug stores, agar-agar is hardly fit to be placed in the stomach. Agar-agar comes from the Orient, where many undesirable germs flourish. It is important to make sure that it has been properly cleansed and sterilized. Most of the agar sold is simply the commercial product chopped up and put in packages. This does not appear to be a safe practice.

Clean agar-agar in granular form may be used without any possible injury in all cases of sluggish bowel action. When properly prepared, it is wholly free from unpleasant flavor. It manifests an astonishing avidity for water, of which it may absorb an amount to increase its weight tenfold. When it is present in the residues, they cannot possibly become dry and hard.

Agar-agar must be taken in sufficient quantity to accomplish the object sought. Two-thirds of an ounce to an ounce is usually required for adults. For young children a quarter to a half of this quantity is sufficient. It is easily taken in soup, hot beverages, fruit juice or stewed fruit. It should be allowed to soften, and should then



Crude Agar-Agar



Agar-Agar in Sterilized and Edible Form

be swallowed without chewing. It should be taken during meals, in order that it may be well intermingled with the food, and so prevent the formation of hardened residues in the intestine.

Agar-agar may also be used with advantage as a substitute for a meal, when food cannot be taken and when there is no appetite for food. When so used it maintains the intestinal rhythm that would otherwise be lost with resulting constipation. It should in such cases be taken with fruit juice or fresh or stewed fruit. When one finds at night that the usual bulk of food has not been eaten, an extra dose of agar-agar with a little fruit may be taken before going to bed. Little digestive work is required by either the fruit or the agar-agar except to move it along the digestive canal.

Psyllium Seed

Another highly valuable aid to bowel action is psyllium seed, known to botanists as *Plantago psyllium*. It is native to Asia Minor. It grows wild in Greece and is cultivated in Northern Italy and Southern France.

When immersed in water, the small brown seeds pour out an amazing quantity of a peculiar mucilaginous substance, making a coherent gelatinous mass, many times the volume of the original material, that slips easily along the intestine. This mass carries with it food residues and body wastes that are excreted into the intes-

tine, that are highly putrescible and that, if not promptly dismissed, would undergo decomposition and re-absorption in many cases. The mucilage is not acted upon by the digestive fluids; it is not a drug, and is non-irritating, even in cases in which ulcer or inflammatory conditions exist.

When regularly used, psyllium seed alone often proves wholly sufficient, producing large, soft-formed stools with frequent, easy and painless movements. This seed may succeed when other measures fail. The addition of a spoonful of the seed to bran with each meal will rarely fail to secure desired results even in very obstinate cases, for the reason that in addition to supplying bulk it supplies lubrication. Its highly emollient character renders psyllium seed of special service in cases of colitis, fissure (ulcer) and hemorrhoids (piles). In certain cases, the psyllium seed or bran gives more satisfactory results when combined with mineral oil.

Bran

One of the oldest and certainly the most valuable of food accessories for supplying bulk for the correction of constipation is ordinary wheat bran, which consists largely of cellulose in an indigestible form.

It is passed through the intestine without difficulty. The apprehension that some authors have expressed concerning the irritating effects

of bran are wholly without basis, except, of course, that one would not think of using bran in a case of acute inflammation of the stomach or intestines. As a matter of fact, when well softened with water, bran is no longer irritating; it is an emollient. The thin films of cellulose become as soft and pliable as wet paper, and excite the bowel, not by scratching or irritating it, but by a gentle titillation and by giving to the food sufficient mass to distend the intestine and stimulate it to vigorous activity. The cellulose and cork layers of bran absorb water with avidity and hold it, thus keeping the residues soft.

Only the very coarsest bran is efficient. The same is true of agar and other forms of roughage. This was pointed out for agar by Professor Ad. Schmidt, and was proved with reference to bran by the writer some years ago. So-called bran flakes contain only about half as much cellulose as does ordinary bran, and this cellulose is broken up into such fine particles by the process of flaking that it has little or no laxative value. A large flake of bran in the mouth will keep the tongue busy until it is removed. If the same bit of bran were ground into small particles, its presence in the mouth would not be noticed and the tongue would not be excited to action. The same is true of the stomach and intestine.

Scarcely more than a third of the particles of ordinary bran are large enough to produce

a real laxative effect. For this reason much of the bran and many of the numerous bran products now offered on the market are of very little service. Many persons become discouraged in the use of bran because of this. Only especially prepared bran, of which the finer portion has been removed, and only products of which this carefully selected bran is the basis, can be relied upon to produce decided laxative effects.

Experience shows that from one ounce to two ounces of bran must be taken with the food daily, that is, one or two rounded tablespoonfuls at each of the three meals, to insure sufficient bulk for stimulating the intestine to action. In cases in which the colon is greatly enlarged or is crippled by adhesions, even a larger amount may sometimes be needed.

It should be mentioned further that when using cellulose in concentrated form, as in sterilized bran, the whole amount used at a meal should not be taken at once, as at the beginning or end of the meal. It should be well mixed with the food by being taken in small portions at frequent intervals during the meal.

In some of its commercial forms, bran is scarcely fit for use on account of the large amount of dirt that it contains, including multitudes of bacteria. For use as a laxative, bran should be carefully prepared by a thorough cleaning of the wheat before grinding and by

sterilization after milling. Sterilized bran, first introduced by the writer nearly thirty years ago, is now prepared by various manufacturers, and is put up in convenient packages.

Sterilized wheat bran needs only softening and is ready for immediate use. It may be eaten as a breakfast cereal, or it may be mixed with any other suitable food, such as oatmeal, toasted flakes, or even mashed potatoes or boiled rice. It may be added to bread, biscuit, cake and breakfast cakes in proportion of one-fourth or even more. Numerous excellent recipes are now available for using bran in various palatable and efficient ways.

There are cases in which bran fails to produce the desired effect without being supplemented by the use of mineral oil as a lubricant. This is particularly true in cases in which the cecum is greatly dilated or crippled by adhesions, and in cases in which there is obstruction of other parts of the colon, especially the pelvic colon as the result of adhesions. The combination of mineral oil with bran or agar-agar in some form is also useful in cases of spastic contraction due to colitis.

Besides its value in supplying bulk and titillation to the intestine, bran is valuable as a food, and in this respect is superior to all other forms of "roughage," that is, bulk-supplying food elements. It is also a valuable source of protein. In laboratory feeding experiments it has been

used to replace meat as a source of protein, and with excellent results.

Bran contains more than ten times the amount of vitamin B found in average foodstuffs. Also, bran is rich in iron and other food minerals, which are deficient in the denatured foodstuffs that make up the major portion of the average bill of fare. Bran contains nine times as much food iron as is found in an equal weight of white bread, three times as much as in graham bread, twice as much as in lean meat, eight times as much as in the potato and thirty times as much as in milk. The only foods that are as rich in their content of iron as is bran are egg yolks and lentils.

For Lubrication

Normally lubrication is supplied by the mucous membrane of the intestine, and particularly by the appendix, which, according to Macewen, is simply a large mucous follicle that has for its function to supply a lubricating mucus at the head of the colon where the food residues are received from the small intestine.

This lubricating mucus not only protects the mucous membrane from friction, but serves as a defense against the attacks of bacteria that are always present in the colon contents. The poisons produced by putrefactive bacteria irritate the mucous membrane and excite its glands to over-activity. The glands also become

infected by the penetration of bacteria into their interiors. In time, degeneration occurs, causing destruction. The appendix, if it has escaped the surgeon's knife, is found, in the majority of adults, in a shriveled and useless condition as the result of chronic infection.

Fats

Oils and fats stimulate intestinal action. Not only fats themselves, but the glycerin and soaps, which are formed by the digestion or decomposition of fats in the intestine, are very efficient aids to intestinal movement through their effect in modifying the character of the food residues. They render the mass less adhesive, and to some extent prevent dryness. Both animal and vegetable fats are digestible and absorbable, however, and hence are not decidedly laxative unless taken in amounts so large that a considerable portion remains behind in the colon. Such great quantities of fat encourage putrefaction, lessen appetite, diminish the secretion of hydrochloric acid, interfere with the motility of the stomach and the small intestine, and may produce great disturbance of the body metabolism through acidosis.

Mineral Oil

Mineral oil is not a fat. It is wholly indigestible and non-absorbable, and has no chemical influence on the intestines. It acts, instead, as a

lubricant. It is, therefore, free from the objections of animal and vegetable fats.

For supplying to the diseased colon the lubricant that its glands have lost the power to produce, refined mineral oil has, therefore, proved a priceless boon to millions of people.

A comparatively small amount of mineral oil serves the purpose required because all of it remains in the intestine. It prevents the drying of the feces, lubricates the colon and rectum, hinders the excessive absorption of water and thus keeps the bowel contents moist.

One of the most interesting features of the many-sided useful activities of mineral oil is its behavior toward intestinal toxins. These toxins consist, not only of bile acids and alkaline wastes of various sorts excreted by the intestinal mucous membrane, but, in addition, of a great variety of toxins produced through bacterial action, especially in the colon and also in the small intestine in cases of incompetency of the ileocecal-valve. Mineral oil is a highly active solvent, and readily dissolves these waste and poisonous substances, many of which are more soluble in mineral oil than in water. The result is that the oil, itself not absorbable, takes up a very considerable portion of toxins found present in the intestinal tract and thus prevents their absorption. The oil may be seen in the stools showing a brownish color, due to the substances that it holds in solution.

In a laboratory test made by a competent chemist by request of the writer, it was found that when mineral oil was shaken with a watery solution of indol, more than half of the indol was quickly taken up by the oil. The use of mineral oil thus affords an effective means of hindering the absorption of intestinal toxins, and of conveying them out of the body.

Mineral oil also serves a useful purpose in protecting the mucous membrane when it is in an irritated state, as in cases of chronic colitis. The value of petrolatum and other neutral petroleum products as a dressing for wounds is well known. They act in an equally favorable way upon irritated mucous surfaces. They have long been used for this purpose in the treatment of diseases of the nose and throat.

Mineral oil serves another useful protective purpose in hindering the absorption of poisons by mucous surfaces which have been deprived of their epithelium. The normal epithelial covering of the intestines has remarkable filtering powers, by which toxins, especially colloid poisons, are excluded. This filtering power is lost when the surface is inflamed or denuded.

In cases of colitis, mineral oil not only protects the irritated surfaces, but also, through lubrication and softening of the intestinal contents, greatly aids in overcoming the spastic condition of the intestine that in many cases of chronic constipation is a most formidable

obstacle to recovery. On the other hand, drug laxatives and drugs of all sorts increase the spasticity of the intestine, and so aggravate the constipation that they are given to relieve. It is because of this that patients are more constipated after taking a laxative than before. Temporary relief is obtained by the production of watery stools that are able to pass through the contracted bowel, but as soon as the first effects of the laxative pass off, constipation becomes worse than before, since the spasm is greater.

Medicinal laxatives increase the anti-peristalsis by which the colon contents reflux into the small intestine in cases with incompetent ileocecal valve. Case has shown by X-ray examination that mineral oil increases the motility of the small intestine, while it does not increase anti-peristalsis, and so is a rational and efficient remedy of great value in dealing with this very large and important class of cases.

The regular use of mineral oil relieves hemorrhoids and fissure, even when of some years' standing. These morbid conditions are usually the result of constipation, and are maintained and aggravated by straining at stool. By the habitual use of mineral oil, the stools are made soft, straining is avoided, the intestinal contents are rendered less irritating and infectious, and thus the diseased tissues are readily healed.

Since adopting the use of mineral oil, the writer has found that the number of cases in

which operation for hemorrhoids is needed is greatly reduced. Patients who have contemplated submitting to operation for removal of hemorrhoids of many years' standing often find themselves so completely relieved in a short time after beginning the use of mineral oil that an operation is no longer necessary.

Mineral oil is capable of rendering invaluable service in most cases of intestinal intoxication by increasing the number of daily stools. This greatly lessens the opportunity for the development of putrefactive processes and the absorption of their poisonous products. In some cases, however, autointoxication seems to be increased by the increased fluidity of the stools.

Petroleum oil, as found in its native state, has long been used by primitive people and pioneers as a remedy for constipation. Sir Arbuthnot Lane of London informed the writer that he had learned from authentic sources that petroleum had been used for centuries by the Kaffirs. It is well known that it was employed as a domestic remedy in America long before it was used for illuminating purposes. The oil was found floating upon the waters of certain streams and was collected and sold by itinerant peddlers, and occasionally in drug stores.

Mineral Oil Emulsions

Emulsions of mineral oil are more acceptable to most palates than the pure oil, but they are

less effective for the reason that they contain a considerable percentage of water, which is of course inactive. In the intestine the emulsion is broken up, and so a larger dose is required to produce an equal effect.

Certain unscrupulous manufacturers have deceived the public by adding minute quantities of agar to the emulsion and exploiting the idea that their preparations were thus made to combine with the lubricating effects of mineral oil the bulk-giving properties of agar. A whole bottle of such an emulsion contains no more agar than is required for a single effective dose.

Solid Mineral Oil

Certain unpleasant effects attending the use of mineral oil, petrolatum and the various emulsions, have led to their disuse by many persons, and some physicians decline to prescribe these preparations. The chief objections met are the following:

1. An unpleasant oily taste, which to some people is so disagreeable as to produce nausea and loss of appetite.

2. A disposition to separate from the other intestinal contents. The oil usually appears in the toilet bowl as a brown liquid separated from the rest of the stool. The oil floats while the rest of the stool sinks.

3. Mineral oil readily finds its way to the rectum ahead of the other bowel contents, and very

easily escapes, either with or without the expulsion of flatus. The patient is often unconscious of the escape until it is noted that the clothing is soiled.

The writer some years ago devised a mineral oil preparation that is solid at ordinary temperatures but soft and plastic at the temperature of the body. This new preparation, in tablet form, and known commercially as Paramels, has proved to be free from the objections to which liquid mineral oil preparations are open. Instead of separating from the intestinal residues and therefore "leaking," it attaches itself firmly to them and does not even appear in the toilet bowl, although positive evidence of its presence is found in the fact that the entire stool floats instead of sinking.

It is to be remembered that it is the food or food residue, rather than the alimentary canal, that requires lubrication. It is disregard of this fact that renders mineral oil ineffective in many cases. Oil taken before the meal passes along the intestine ahead of the food. Taken after the meal, it follows after the food. Inspection shows a quantity of oil floating upon the water surface. This floating oil has rendered little service as it has not been mixed with the food.

In use, Paramels are cut into small pieces, which are taken at intervals during each meal, and always thoroughly mixed with the food. Paramels are often needed in addition to rough-

age foods. Having a melting point slightly above the body temperature, this new form of mineral oil at the body temperature acquires the consistency of a soft ointment that adheres to the food residues and serves as a most efficient lubricant.

In exceptionally obstinate cases this special mineral oil may be injected into the rectum at night with great benefit. The temperature should be 104° F., the quantity two to eight ounces.

Another advantage of this preparation is the fact that it is much more efficient than the liquid oil. A single small tablet is more than equal in effectiveness to an ounce of liquid oil. This is due to the fact that all of it is utilized; whereas most of the liquid oil separates from the food. This is true of the emulsions as well as of the plain oil.

Paramels are especially convenient for travelers.

PHYSIOLOGICAL MEASURES FOR COMBATING CONSTIPATION

So many different factors are involved in the function of bowel movement, it is highly essential that a person who is suffering from chronic constipation should seek by every available means to improve his general health, and thus to increase the vigor of all his bodily functions.

Constipation is in most cases simply one of the unhappy results of the artificial conditions imposed upon us by modern civilized life. The only escape from this terrible handicap to all useful human activities is to be found in a rational return to Nature, in the adoption, as far as is necessary to secure the physiological conditions, of natural and primitive habits, particularly in reference to diet, exercise, rest and recreation and an out-of-door life.

Deep Breathing

Bodily movements have a certain amount of influence upon the position of the pelvic loop and upon the entrance of feces into the rectum, especially the movements involved in deep breathing.

The diaphragm is pushed down upon the abdominal viscera, compressing the colon as well as other parts against the abdominal wall. By

this means the feces in the pelvic loop may be pushed on into the rectum, thus evoking a "call."

The deeper breathing, and the compression of the abdomen contents resulting from movement, are no doubt the reasons why many persons experience a "call" almost immediately upon awaking after a full night's rest. During sleep the pelvic loop has slowly been filling and rising, but the pressure has not been quite sufficient to cause the feces to pass into the rectum. A push from the diaphragm and the abdominal muscles gives the little extra help needed.

A child does not have to be taught to breathe. It breathes instinctively and hence correctly, for all movements are physiologically and efficiently performed. But the breathing muscles are voluntary muscles, and hence may be controlled by the will. This fact permits modifications of the act of breathing, which may or may not be physiological.

Unfortunately, the conditions of civilized life are such as lead to serious perversions of the breathing process. Normally, when air is inhaled the whole chest is enlarged, but the chief movement is at the lower sides of the chest. This broadening of the chest at its lowest part stretches the diaphragm and thus gives it an opportunity to exert its greatest force in compressing the abdominal organs. Its form being arched, this is highly important. If its ends are held in place, the top of the arch can descend

only a little, and while breathing is ineffective, the lungs being imperfectly expanded, the compression of the abdominal organs is equally inefficient.

The diaphragm, it must be remembered, is a double-acting pump. It creates a suction in the chest, while at the same time it produces pressure in the abdomen. If its work is imperfectly done in one direction, it fails equally in the other.

The compressing movements produced by the diaphragm at each inspiration are, when efficient, of great service in assisting the movements of the food along the alimentary tube. Acting upon the stomach, which lies just beneath it, the diaphragm churns the food and aids in pushing it along into the intestine. Acting upon the colon, which on the left side lies in contact with it, the diaphragm renders great assistance in helping to push the food along toward the rectum.

But it is especially in the act of defecation that the action of the diaphragm is important. The very first step in the process of unloading the bowel is the sinking of the colon by a very deep breath. If the sides of the chest are compressed by belts or other tight clothing so that they cannot expand, the diaphragm cannot descend more than a short distance, and its action is inefficient. As a result, the fecal matters stored up in the descending and pelvic colon

are not pushed onward to the rectum, and the bowel is only partially emptied. Thorough natural bowel movement is not possible without free and vigorous movement of the diaphragm.

So, too, if the diaphragm is weak because of habitual shallow breathing, the result of a bad position in sitting, the same result follows. Any position that hampers the movements of the chest thus leads to constipation.

Exercise

Every farmer knows the constipating effect upon his horses and cattle of idleness. Many persons who are habitually constipated observe that the bowels move regularly and several times daily when much exercise is taken, as during a vacation or outing.

The sedentary man or woman loses the immediate benefit that results from the increased activity of the diaphragm and abdominal muscles. Also his abdominal muscles become permanently weakened, relaxed, lacking in tone, and incapable of supporting the intestines in their proper place, thus adding a number of factors that contribute very materially to the lessening of intestinal activity.

Exercise promotes bowel action, not only by aiding respiration and inducing vigorous movements of the diaphragm, but by calling into strong action the muscles of the abdomen and by raising the general muscular tone of the body.

The one-a-day habit appears only among those classes of people or castes who live a sedentary life and have adopted unnatural habits in diet, such as the use of hot condiments, concentrated food, etc. The aristocratic classes of India and China afford striking examples of this, suffering much from constipation in consequence of their idle and luxurious habits, and from the use of curries and other unwholesome condiments; while the working classes, whose diet and habits of exercise are more nearly normal, are generally exempt.

The excellent effects that walking has upon bowel activity are well known. Horseback riding is also of great advantage in the same way. These exercises, as well as many others, mechanically stimulate the colon, as well as each other part of the intestinal tract, by communicating to it a continued series of slight shocks by which reflex movements are excited. Riding a considerable distance is necessary, however, to produce any decided effect, as, on the whole, horseback riding to a person accustomed to it is not very active exercise, except when riding a hard-trotting horse.

The active play of children is as necessary to maintain proper bowel action as for muscular development. The movements of skipping, hopping, jumping, are all highly useful exercises because they induce sudden vigorous contractions of the abdominal muscles and vigorous

diaphragm movements by which the colon is compressed and stimulated.

The crying of infants is useful as a means of exercise. Many pediatricists recommend letting the infant cry for fifteen or twenty minutes before feeding, so as to improve appetite and digestive vigor.

The folk dancing of the Middle Ages, which has been revived in recent years, is for the above reasons to be highly commended as a health measure. It is important, however, to make a clear distinction between the varied and vigorous movements of the folk dance, in simple dress and under wholesome conditions, and the monotonous and restrained movements of the social dance, in full dress and under conditions always physically, and not infrequently morally, unwholesome.

Those whose occupations are such as to give them plenty of exercise are fortunate in being able to lead lives that in large measure conform to health requirements. Those who are compelled to lead sedentary lives must take daily and regular exercise of a sort calculated to benefit the bowels if they would escape the evils of constipation.

The exercises of greatest value are those that strengthen the abdominal muscles. When they are weak and relaxed, the intra-abdominal pressure is consequently low. By appropriate exercises, the weak muscles may be strengthened,

the intra-abdominal pressure may be raised, and the colon may thus be enabled to contract with sufficient vigor to expel its contents.

Inclined Plane Exercises. Among the most important of all forms of exercise, for combating constipation, are a series of simple exercises that are taken upon an inclined plane, with the head low. The special advantages of the inclined plane are that the head-low, hips-high position greatly aids in the replacement of the prolapsed stomach and colon; also it drains the abdomen of blood, thus relieving congestion of the viscera.

Exercises of the trunk muscles should always be taken after the prolapsed viscera have been restored to position, otherwise the displacement may be increased whenever the abdominal muscles are strongly contracted.

The folding exercise table is a convenient appliance for use in these exercises. It may in part be replaced by an ordinary ironing board with one end resting upon the side of a bed, couch or window sill, the other on the floor. The exercise table is provided with a strap at one end to hold the feet and prevent slipping down, and with a rope and handle for pulling the body up. At the sides are placed handles to be grasped by the patient.

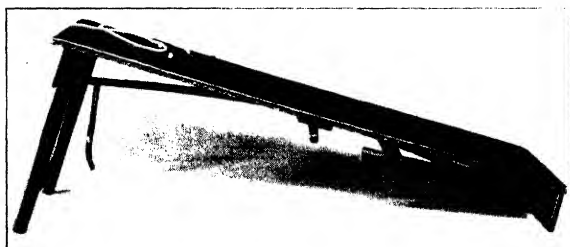
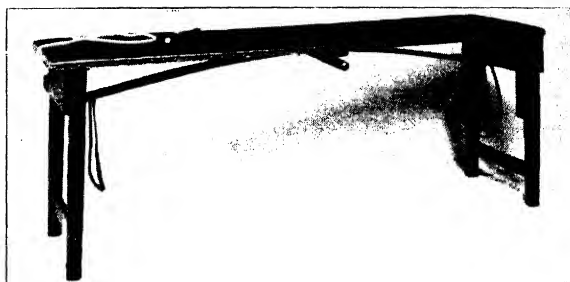
Stretching Exercise. After getting into position upon the table, take a few very deep breaths, holding the chest high while breathing out. Grasping the handles, bend the head back-

ward as far as possible, at the same time widely opening the mouth as in yawning. Then stretch with the right arm and left leg. Grasping handle with left hand, raise the right arm above the head and at the same time point the toe of the left foot. Reach as far as possible in opposite directions. Do the same with the left arm and right leg.

Leg-Raising Exercise. Lie on the back, hands grasping the handles, while holding both legs straight and toes pointed. Raise the legs to a vertical position while counting four. Lower at the same rate. Repeat eight to twelve times, taking one or two deep breaths after each movement.

Trunk-Twisting Exercise. Back lying, feet under strap, throw the extended right arm over to the left, at the same time turning the face and shoulders in the same direction. Return to position, and repeat eight or ten times. Do the same with the left arm.

Hip-Rolling Exercise. Back lying, draw the knees up as far as possible, then extend the limbs vigorously toward the left and roll the body in the same direction. When the legs are completely extended, carry them straight across to the opposite side, rolling back toward the right side. Complete the movement by drawing the legs back to the flexed position and returning to the starting position. Repeat ten or twelve times, pausing long enough after each movement



A Folding Exercise Table

to take one or two deep breaths. This is a most excellent exercise for all the muscles of the trunk.

Exaggerated Knee-Chest Breathing. Grasping the handles, rise to a kneeling position and then take the knee-chest position. Take ten to fifty deep breaths. This is a most effective means of draining the overfilled blood vessels of the abdomen and pelvis, and of setting gravitation at work pulling the prolapsed organs into position. The exercise is still more effective if taken after filling the colon with water, as the added weight of the prolapsed organ assists in restoring it to position.

To Strengthen the Abdominal Muscles. Raise both legs to the perpendicular. Repeat ten to forty times. A deep breath should be taken just before the legs are raised, and after each movement there should be a pause during which a deep breath is taken.

Feeble and very fleshy persons are often at first not able to raise the legs. In such cases the exercise may begin with the legs drawn up to a fixed position. By extending the legs and allowing them at the same time to drop slowly to the starting position, the abdominal muscles may be brought into strong contraction, and as they gradually increase in strength, the legs may be flexed less until they can be raised to a vertical position without flexion.

Swimming is perhaps the most excellent of

all forms of exercise. The muscles are beneficially influenced, not only by the movements executed in the water, but by the tonic effects induced by contact of the skin with water at a temperature below that of the body. Swimming is a capital exercise for the abdominal muscles, as well as for the muscles of the trunk, especially because the position that it is necessary to assume retracts the abdominal muscles and lifts the chest well forward.

Hill climbing is a valuable exercise, and more so than walking on the level because the abdominal muscles are brought into more active play. When mountain climbing is not an available form of exercise, nearly the same results may be obtained by climbing a ladder or by walking up and down stairs. The writer has also made use of the treadmill as a means of securing climbing exercise.

Rowing is one of the very best of exercises to combat constipation, provided the chest is held high during the exercise, and especially if care is taken to give the trunk as strong a backward movement as possible. Care must be taken to avoid holding the trunk forward with the shoulders rounded and the chest depressed.

Tennis may be highly commended for young persons and those who are sufficiently strong to engage in this form of exercise without injury. This very popular game is, however, too vigorous for persons with weak hearts,

Work exercises, the movements of chopping and digging, swinging the hammer and mowing, are highly valuable if taken with due care to maintain the body in an erect position. Many household occupations, such as scrubbing, washing and general housework, are excellent forms of exercise when correct posture is maintained.

Rolling over on the floor or on a wide bed for five minutes is a capital exercise for strengthening the lateral muscles of the trunk.

The medicine ball is a beneficial exercise for persons who are fairly strong and have no heart weakness. It brings the muscles of the trunk into vigorous action.

The rocking exercise, lying, is very effective if taken vigorously and repeated three times a day for five or ten minutes. Flex the left leg upon the abdomen. Clasp the hands beneath the knee and pull as hard as possible, so as to force the thigh down upon the abdomen. Then, with the other leg fully extended, cause the body to execute rocking movements by quickly moving the leg up and down, assisting by forward and backward movements of the head. Repeat with the right leg.

The squatting exercise is an excellent means of stimulating bowel movement. Standing, with the heels separated ten or twelve inches, the hands upon the hips, execute squatting movements, bringing the trunk as near to the floor as possible and bending slightly forward.

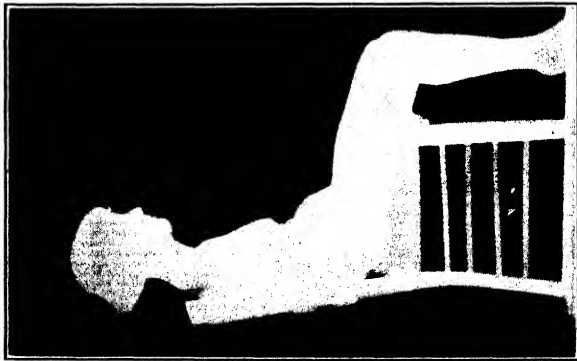
Running on all fours was prescribed by a Berlin physician for an eminent German statesman, with excellent results. With arms and legs extended, run about the room on all fours for five or ten minutes.

Posture

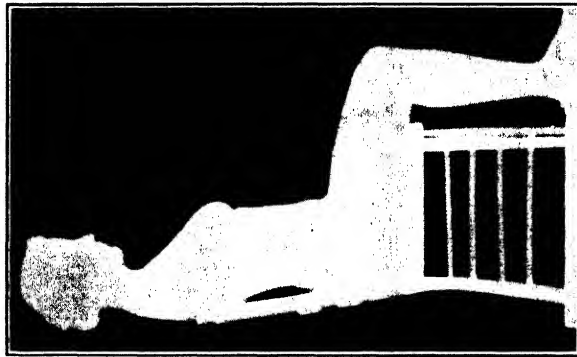
A posture that relaxes the abdominal muscles and so weakens them by disuse that they lose their normal tone may become a potent cause of constipation. Such a relaxed condition necessarily interferes with both voluntary and reflex contraction of the important muscles that are an essential factor of normal defecation.

It has been shown that a slowing of the blood movement through the intestine results in a slowing or interruption of peristalsis. The mass movement of the colon that takes place normally during or immediately after a meal, is without doubt due to the quickening of the circulation that occurs as the result of the entrance of food into the stomach, by which the whole digestive system is excited to activity. This increased movement of blood through the intestines during digestion is so great that other forms of bodily activity are often more or less interfered with, particularly the activity of the brain, which, when vigorous, requires one-fifth of the total blood supply of the body.

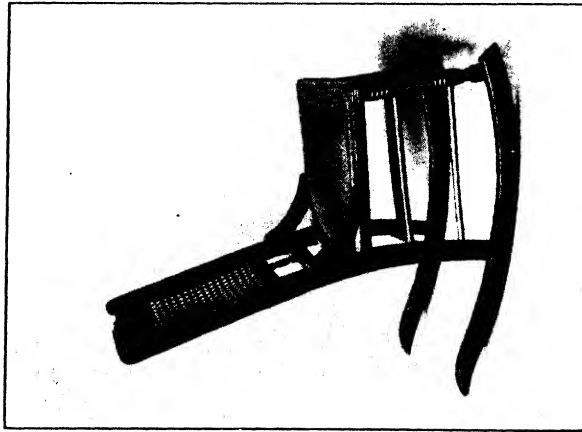
Students, writers, bookkeepers, seamstresses, most professional men, and most persons whose



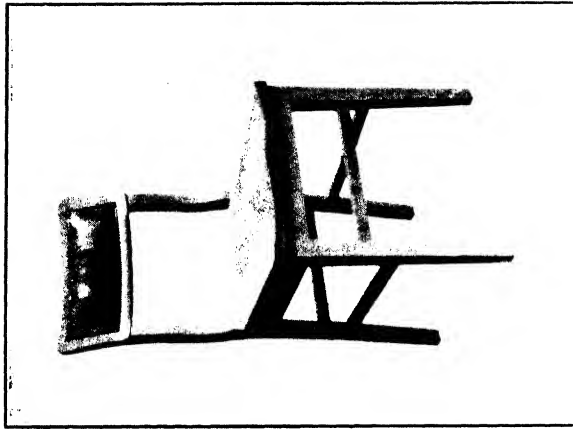
A Slumped Sitting Posture
(Shadowgraph)



A Correct Sitting Posture in a Badly
Constructed Chair
(Shadowgraph)



A Disease-Producing Chair



The Perfected Posture Chair

habits are sedentary or who sit much at their work, are liable to assume a relaxed position, as shown in the accompanying cut. This posture robs the abdominal vessels of the mechanical support that they require from the abdominal walls.

Persons who habitually sit in this relaxed position retain the same attitude when on their feet, so that the abdominal blood vessels are constantly filled with stagnating blood, the natural result of which is a deficient activity of the intestines and an abnormal accumulation of food residues in the colon.

Of first importance to persons suffering from constipation is the maintenance of an erect position of the trunk. When the chest is lowered, as when sitting in a relaxed attitude, the distance between the breast bone and pelvis is diminished, so that the large muscles that form the front of the abdominal wall are shortened and relaxed. In this attitude the muscles cannot be contracted sufficiently to produce the proper degree of intra-abdominal pressure. When the chest is held high, the rectus muscles are stretched and are thus able by contraction to produce the maximum effect in compressing the colon. Flat-chested persons are predisposed to constipation because of inefficient action of the abdominal muscles.

To correct the sitting posture, sitting upon a chair or stool, preferably the latter, place the

hands on the hips, with the thumbs behind. Bend the head backward so as to look straight up to the ceiling. Bend forward as far as possible while still keeping the eyes on the ceiling. Make firm pressure with the thumbs, and while pressing hard bring the body up to an erect position. Still keeping the eyes on the ceiling, holding the elbows as far back as possible without for an instant lessening the pressure on the thumbs, bring the chin down.

If this movement is executed according to directions, it will bring the body into perfect position, with the chest raised high and the abdominal muscles well drawn in, as shown in the shadowgraph of a correct sitting posture (see cut).

To secure definite and beneficial results, it is necessary to habitually use a chair having a back of the right shape.

The Perfected Posture Chair

While many elements enter into the perfect chair, the support of the upper dorsal spine is the master key which solves the problem.

When the trunk is permitted to fall under the influence of gravity, that is, when the head drops, the shoulder blades slide forward, allowing the upper dorsal spine to fall back, a severe and unnatural strain falls upon the costotransverse ligaments and other of the posterior liga-

ments and muscles of the neck and trunk. By placing a proper support between the shoulders, the spine is held forward, the shoulder blades are held in place by gravity, and the weight of the head is carried by the spinal stem and thus the muscles are relieved. The lifting of this load of work off the neck muscles, gives a new and relieving sense of complete rest and comfort in sitting so striking as to be almost incredible until experienced. The accompanying cuts show the principle applied to an opera seat and an office chair.

Posture in Defecation

The natural position in defecation is squatting or crouching. All savages assume this attitude in moving the bowels. The reason for this is that in the natural position the abdomen is compressed by the thighs, thus the feces are forced into the rectum, and so the automatic process of bowel movement is set going. The ordinary water closet is so constructed, however, that natural bowel movement is impossible. By bending strongly forward, some compression of the thighs may be effected, but it is only in the squatting position that the pressure can be as great as is possible and often necessary. By placing a low platform in front of the closet, so as to raise the feet eight or ten inches, the proper position may be assumed. Some closets are now made low and sloping with this idea in view.

Many surgeons have learned the importance of the squatting position to secure complete evacuation of the bowels and bladder, and forbid the use of the bed pan in any except the feeblest cases, requiring the patient to be supported if necessary while using the chamber.

Although this matter is one of very great importance, it is more than likely that half a century will pass before manufacturers and plumbers, upon whom we are dependent for these necessary conveniences, will recognize to any appreciable extent the need of a change in closet construction.

The squatting position in moving the bowels appears to be universal among all people with the exception of those who call themselves civilized. It is singular, indeed, that in relation to this most important function of the body the wildest and most unsophisticated natives are really in advance of the most highly civilized people. The value of the squatting position as a means of relieving the bowels has been recognized for years, but the knowledge has had little influence upon the habits of the people in this particular.

Dr. W. J. Maule of Miraj, India, states that the native position is squatting at stool, with front of thigh against the abdomen for encouraging evacuations.

Dr. T. Davidson of South Travancore, South India, says that the position in which the native

helps his expulsion of feces from colon and rectum is to sit on his haunches and press the left side of the lower abdomen with the hand or a bunch of cloth. The practice above referred to is interesting evidence of the East Indian's capacity for intelligent observation. The descending colon and pelvic colon are located in the lower left side of the abdomen, and pressure just at this point may be of the greatest value in aiding evacuation of the bowels.

Dr. Belle J. Allen of Baroda Camp, P. O., India, says, "The chief practice is the habit of squatting at stool. Have had patients leave the hospital because they could not have a normal movement without their own kind of commode. Complaints ceased with a native place provided." It is interesting to note that Doctor Allen's patients were willing to forego the advantages of hospital care rather than suffer the serious consequences of disturbed bowel action from interference with normal defecation.

An opening in the floor over which the user squats is the provision made for bowel evacuation in many parts of Europe and the Orient.

Posture during Sleep

The force of gravitation exerts a decided influence upon the contents of the stomach and intestines. The influence of this force is of little moment in conditions of health; the food is

grasped by the digestive tube as soon as it reaches the back of the throat, and this vital grip is maintained until the residue of the food is cast out at the anus.

In disease, the situation may be greatly changed. The walls of the stomach, instead of contracting upon the food and kneading it, may be relaxed and hang loosely separated like the sides of a bag. The stomach no longer grips the food, and so gravitation controls it to a large degree. Under these circumstances it is best for the patient to sleep upon the right side, in case a meal has been eaten within two or three hours before going to bed, or if there is evidence of the presence of food or liquid in the stomach on retiring.

When the cecum is known to be dilated and the seat of stagnation, it is well to sleep upon the left side, so as to facilitate the movement of residues along the relaxed colon.

When the abdominal muscles are much relaxed and the whole colon dilated, so that intra-abdominal pressure is much reduced, it is well to sleep upon the face, so that the weight of the body may, by constant pressure upon the abdominal contents, aid the progress of the feces along the crippled colon.

Such persons are also benefited by lying upon the face for half an hour or an hour after each meal. The nervousness from which many dyspeptic and constipated persons suffer after eat-

ing may often be relieved and prevented by this simple custom. It not only aids the passage of liquids from the stomach, but helps the colon and prevents the excessive congestion of the viscera, which naturally results from the excitement of digestion when the intra-abdominal pressure is very low.

It should be observed that it is not well to sleep long after eating, though a short nap, lying on the face, will do no harm and may encourage bowel action.

Thin persons may often adopt with advantage the practice of sleeping on the face with a pillow beneath the abdomen. Backache, and various discomforts in the abdomen, especially in cases of colitis, may often be relieved by this simple procedure.

Massage

Another valuable means of stimulating the bowel to increased activity is massage.

To be effective, massage intended to influence the intestinal movement must be given by an expert. It must definitely reach and sharply compress the colon so as to stimulate it to action. The colon can best be reached at the sides of the abdomen near the groins.

A radiogram or a tracing made by the aid of the X-ray, showing the position, size and form of the different portions of the colon, is of the greatest service in abdominal massage. With

the radiogram and such a sketch of the colon at hand, the masseur can make his applications with such a degree of accuracy as to effect a maximum amount of good with a minimum degree of effort, and without wearying his patient needlessly.

The following methods of colon massage are described at greater length in the author's work on massage.*

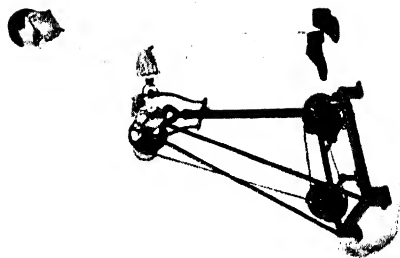
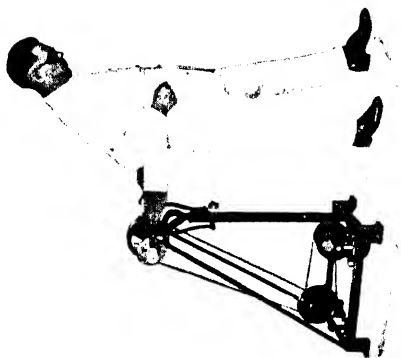
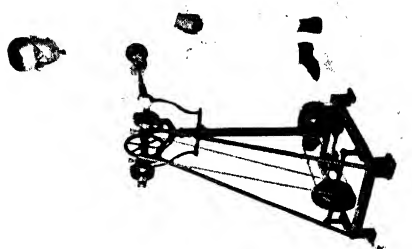
Massage of the Cecum. In cases with stagnation of the fecal matters in the cecum and ascending colon, massage should be applied with the patient's hips elevated to an angle of about 45°. Deep kneading movements should be made from below upwards, working along the colon in the direction of the lower ribs of the right side. When the liver is reached, the kneading movements should be carried across the body in the direction of the transverse colon. The hips of the patient should then be lowered, and the kneading movement directed downward along the descending colon, starting from the lower rib of the left side. When the upper border of the hip bone is reached, the movement should follow the inner surface of the bone to the pelvis.

Not infrequently the descending colon is found in a contracted or spastic state, when it feels like a rubber tube and may be rolled under the fingers. It is usually sensitive to pressure.

*"The Art of Massage," Modern Medicine Publishing Co., Battle Creek, Mich.



Kneading the Colon



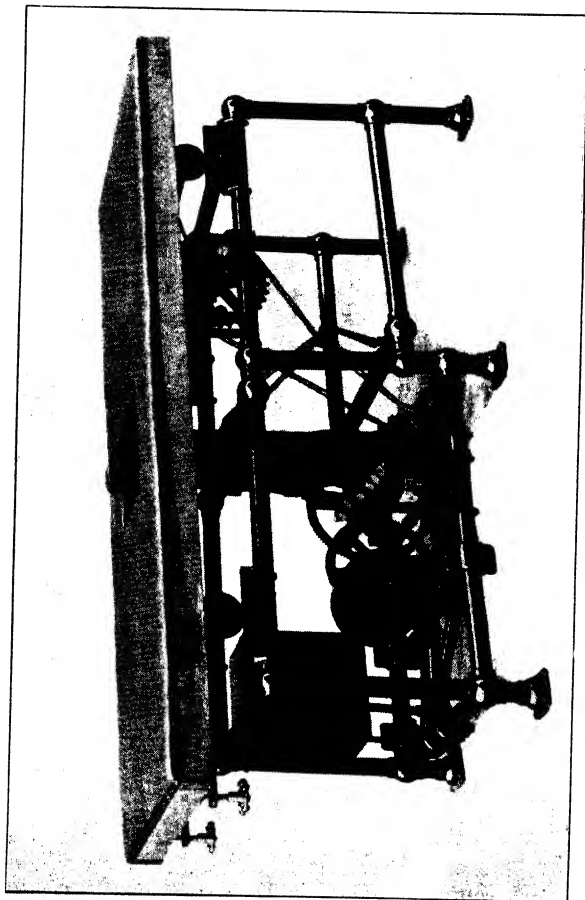
Mechanical Massage of the Colon with the Oscillo-Manipulator

When the pelvic colon is enlarged, it also may sometimes be felt, though not infrequently when it is distended with feces it lies so low in the pelvis that it cannot be reached. By putting the patient in a knee-chest position, and executing deep-breathing movements while making deep pressure with one hand on each side just above the groins, the pelvic colon may sometimes be lifted out of the pelvis, brought within reach, and the hard masses with which it is filled broken up. This position also facilitates manipulation of the dilated cecum.

After careful manipulation for a few minutes, the contracted colon will dilate and the spastic condition disappear for the time being. The writer has often noticed this in making examinations of the colon.

Harsh manipulations are, however, liable to produce the opposite effect, increasing the spasm. This fact has led some authors to forbid massage altogether in cases of colitis. This is quite wrong. Massage is highly beneficial in these cases, but the manipulations must not be severe.

Self-Kneading of the Pelvic Colon. In many cases of cumulative constipation, the chief trouble is in the pelvic colon. This loop of the intestine, usually about a foot in length, and possessing thick muscular walls, becomes sometimes so enormously stretched and attenuated by accumulations of fecal matters and gas that its walls contract very feebly, and it is



Bowel Kneading Apparatus

Stroking, or reflex titillation of the skin, stimulates the bowel in much the same way that tickling the soles of the feet may give rise to powerful contractions of the muscles of the legs.

The mechanical applications that are of the greatest service are kneading and vibration.

Mechanical kneading of the abdomen is in many cases remarkably effective in relieving constipation. Not infrequently a bowel movement occurs immediately after ten minutes' application.

Deep kneading of the descending colon in the left lower section of the abdomen is especially effective. Often the colon may be felt. If there is tenderness, avoid pressure and apply heat.

Several mechanical kneaders have been devised. The one illustrated in the accompanying cut has been in use by the writer for nearly forty years, and with satisfactory results.* Patients generally realize immediate benefit from the use of the kneader, which may be employed for ten or fifteen minutes twice a day, an hour after breakfast and an hour or two after dinner.

The apparatus consists of six kneading arms attached to eccentrics, arranged in such a way as to be brought to bear upon the abdomen in consecutive order. The surface upon which the patient rests is at the same time moved to and fro in such a way that the kneading movement

*Manufactured by the Sanitarium Equipment Company, Battle Creek, Mich.

travels in a series of circles upon the abdomen. The vigor of the application can be regulated at will.

Vibrators of various kinds are in use. The majority of them are, however, possessed of too little power to be of service in the treatment of the abdomen. The best for this purpose are the dumb-bell vibrator and the vibrating chair.

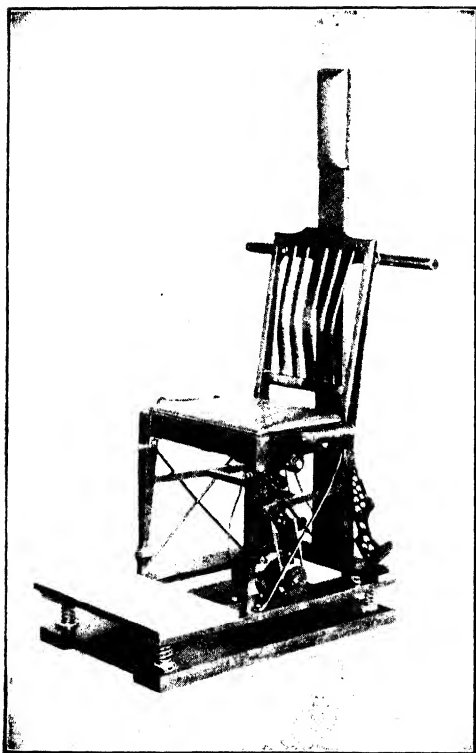
The dumb-bell vibrator has the advantage of being heavy enough to compress the abdomen to a sufficient degree, and of having power sufficient to give the whole abdomen an active vibratory movement. It has been proved that these vibratory movements induce peristaltic action, while at the same time the weight of the instrument increases the intra-abdominal pressure.

The accompanying cut shows a dumb-bell vibrator that is effective when applied along the course of the colon, especially over the pelvic colon that lies low in the left side. Still more powerful effects may be induced by application of the dumb-bell vibrator to the sacrum and the anal region.

The vibrating chair aids bowel action both by directly exciting the centers of the spinal cord and by stimulating the lower bowel.

The vibrating stool, and also the vibrating table, are powerful means by which mechanical stimulation may be applied to the colon.

The oscillo-manipulator is perhaps the best means yet devised for mechanical manipulation



The Vibrating Chair

of the abdomen as well as of other parts of the body. It is surprisingly efficient.

Compression

Beneficial results are sometimes obtained in constipation by increasing the intra-abdominal pressure. Such increase is most effective when applied in cases in which the abdominal muscles are weak and relaxed.

While compression of the trunk at the waist is always harmful, compression and support of the lower abdomen is of service in many cases because of the unnatural feebleness of the abdominal muscles.

In fleshy patients, almost any sort of bandage will accomplish good. In thin patients, however, an ordinary bandage is of little use, for the reason that it is held out in front by the iliac bones, and so does not press with sufficient firmness upon the lower abdomen where support is needed.

The most effective support in such cases can be secured only by a bandage that is compressed by springs. Such a bandage, which the writer has had in use for more than thirty years, is shown in the accompanying cut. In fleshy patients a stout bandage made of ducking and cut to fit snugly is of special service.

The bandage must be worn constantly when the patient is on his feet. Its purpose is not simply to support the viscera, which the best of

bandages can do only in a very small degree, but to increase the intra-abdominal pressure to such a degree as to assist the colon in disposing of its contents. Some patients are completely relieved of constipation by the use of a proper bandage.

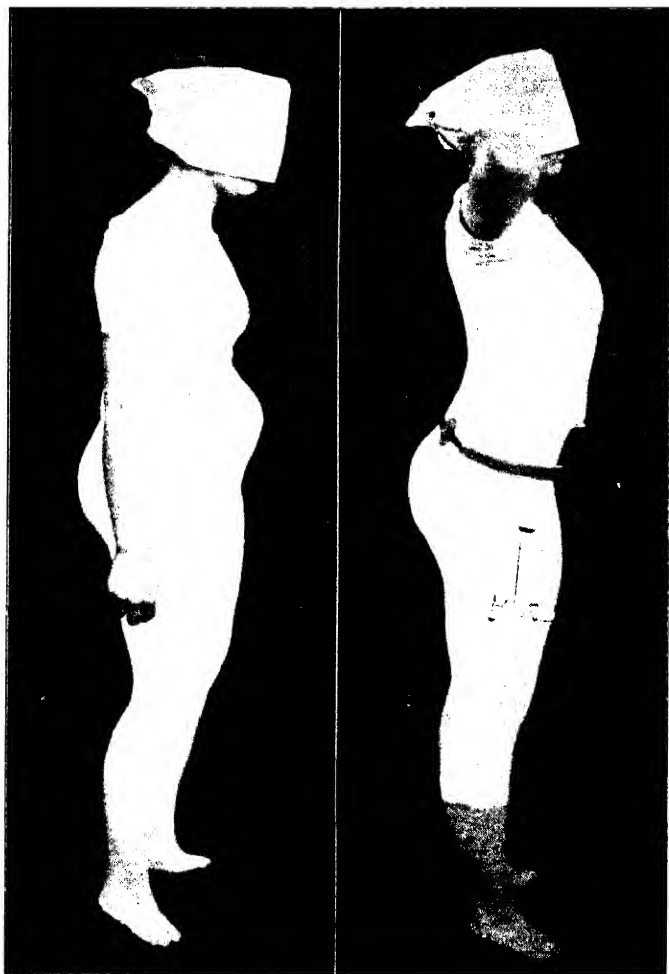
In most cases it is necessary to employ perineal bands to keep the bandage in position at the lower abdomen, where alone it can be of service.

Pain in the back is one of the disagreeable symptoms that an efficient bandage often relieves, especially when the pain is due to enteroptosis, or prolapse of the intestines, rather than to colitis.

A sense of exhaustion often results from low intra-abdominal tension, which permits an undue amount of blood to accumulate in the abdominal vessels and thus robs the brain and spinal cord. This exhaustion is almost immediately relieved by a proper bandage.

The bandage is only a palliative, however, and its use must be accompanied by the development of the abdominal muscles by means of massage, electricity and suitable exercises.

The wet girdle or moist abdominal bandage is a simple measure that has been used for centuries by the peasantry of Europe. The abdominal girdle consists of a coarse towel three yards in length, half of which is wet, the other half remaining dry. Beginning with the wet end, the towel is wound around the trunk, great care be-



THE ABDOMINAL SUPPORTER

Relaxed protuberant abdomen, a result of bad sitting position

The same person standing, poise corrected and abdomen held up by a spring supporter

ing taken to see that it fits the skin snugly. Outside the towel a dry flannel bandage is applied.

In cases requiring use of a supporter during the day, the moist abdominal girdle should be worn at night to aid in relieving congestion. The bandage should be used with the mackintosh protection, and should be removed or renewed before it becomes dry. The bandage may be worn with advantage both night and day. It must be changed or boiled daily to avoid producing skin infection.

The weighted compress, consisting of a thick flannel compress between the folds of which is quilted a considerable quantity, say fifteen to twenty-five pounds, of lead shot, is sometimes beneficial. The compress should be large enough to cover the entire abdomen. It should be applied for an hour before time for evacuation of the bowels, deep breathing movements being executed in the meantime at the rate of twelve to sixteen per minute.

The shot bag is a device with essentially the same purpose as that of the weighted compress. It may be applied in such a way as to secure a more pronounced local effect, as, for example, to force stagnating material out of the cecum. In some cases, it may also be of service in forcing feces from the pelvic colon into the rectum, when the pelvic loop has been weakened by excessive overloading and distention with gas.

The usual weight of the shot bag is twenty

to twenty-five pounds. It should be placed over the spot where the accumulation can be felt with the fingers or seen with the X-ray, and should be left in place for an hour, while deep breathing movements are practised at the rate of twelve to sixteen per minute.

These simple measures have the advantage that they may be used by the intelligent patient at his home, and their use may be continued for an indefinite time without injury.

Baths

Water may render great service in constipation through the general improvement in health that may be secured by its systematic use. Cold water is of the greatest service. To be effective, the applications must be short and intense. The cold spinal and abdominal douches, and the cold douche to the feet and legs, are the most effective external procedures.

A cold morning bath helps both by causing deep respiratory movements, which increase the intra-abdominal pressure, and by causing a reflex contraction of the colon.

The short spinal douche is one of the most effective means that can be employed for improving the tone of the nervous system. Short, cold applications applied to the surface cause reflex contraction of the internal involuntary muscles. It is for this reason that placing the feet, sometimes even the hands, in cold water will often

produce a desire to empty the bladder, through stimulation of the urinary center. The defecating center and intestinal muscles may be stimulated in the same way.

Various local applications are of service in improving the tone of the bowels, but local cold applications must be used with great discretion and with careful knowledge of the exact nature of the case on account of the tendency of cold to produce contraction of the involuntary muscles, which leads to an aggravation of the condition in colitis with spastic constipation.

Hot applications, externally and internally, often aid bowel action by relaxing a spastic or contracted colon. The colon may be contracted as the result of irritation through reflex action from diseased ovaries or some other diseased organ, or even as the result of some depressing emotion such as fear, worry or anger. In such conditions, bowel action is best encouraged by applications of heat, either external or internal, which relax the contracted bowel. The effect of hot applications is to lessen the irritability of the nerve centers, and thus to relieve the intestinal spasm that may be due to congestion or inflammation of the appendix, ovaries, bladder, rectum or gall-bladder, or, still more often, to colitis.

In very pronounced cases of colitis, with spastic constipation, a short, very hot bath is often of

service. The duration of the bath should not be more than two to four minutes. It produces debility and anemia if long continued and often repeated.

A warm bath (100° F.) combined with a very hot spray to the abdomen is perhaps the most effective measure for the relief of intestinal spasms, such as sometimes occur in muco-membranous colitis. The water should be allowed to fall on the abdomen in fine streams with very little force, at a temperature of 115° to 120° F. The duration of the application should be two to five minutes. It should be followed by a cold application at a temperature of about 80° for one or two minutes.

A short cold douche to the lower part of the back, buttocks, abdomen and feet may also aid bowel action. The temperature should be 70° to 50° F., and the duration ten to thirty seconds. With patients who are not accustomed to applications of cold water, the temperature of the douche should not be lower than 70° at first. This should gradually be lowered at each application until 60° to 50° is reached. In general, the douche should be preceded by a short hot bath, to prepare the patient for the cold application and to secure prompt reaction, which is still further encouraged by exercise after the bath.

A warm shower bath (100° F.) *simultaneous with a short cold douche to the abdomen* is a

very excellent form of bath, especially adapted to cases of constipation. The warm shower should be applied for half a minute so that the skin may first be thoroughly warmed. The cold spray or broken jet should then be applied to the abdomen without interrupting the warm shower. The temperature of the spray should be 70° to 50°. The duration of the cold application should not be more than a minute. At the end of the bath, a short, general, cold application lasting no more than ten to fifteen seconds should be made to secure reaction, and thus fix the blood in the skin.

When a douche apparatus is not available, a very efficient abdominal douche may be applied in an ordinary bath tub. A hot bath at a temperature of 102° to 103° should be applied for one to three minutes. Then the outlet should be opened and cold water poured on the abdomen while the water is running out. By lifting the dipper to the height of five or six feet, a sufficient degree of force may be obtained to produce a decided reflex effect. The temperature of the water may vary from 60° to 80° F.

The hot sitz bath at a temperature of 112° to 118° F., duration two to three minutes, is a measure of the highest value for use in the treatment of reflex and spastic constipation, with or without colitis. After the sitz, no cold application is made. The best time for the bath is just before retiring.

The cold sitz bath at a temperature of from 60° to 70° for fifteen to twenty minutes produces powerful and prolonged contraction of internal muscular structures. This bath is useful in diarrhea. It is one of the most efficient means of improving the tone of the abdominal muscles and of a dilated colon. It should not, however, be given in cases of spastic constipation. In general, prolonged cold baths of any sort, that is, baths longer than two or three minutes, are aggravating in this condition. They cause inactivity by inducing a spasm at certain points, possibly at the ileocecal sphincter. This result occurs if the bath is continued for more than seven or eight minutes. When for any reason the use of the prolonged sitz bath becomes necessary, special precautions in diet and other matters must be taken to prevent producing this undesirable effect.

Sweating baths are indicated when the skin is inactive, due to the general saturation of the body with toxins. In constipation these sweating baths should be made short, however, barely long enough to stimulate the skin to vigorous perspiration, and should immediately be followed by a short general cold application, including a cold douche to the spine, abdomen and legs.

The Fomentation

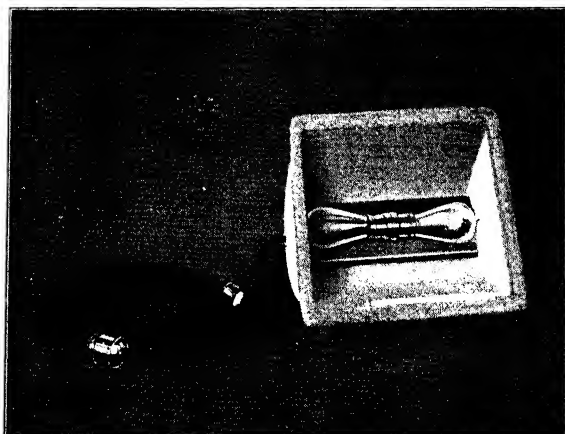
The abdominal fomentation is a capital means for use in spastic constipation, the result



The Fomentation



The Wet Girdle



The Photophore



Applying the Dumb-bell Vibrator

of colitis, and when the ileocecal valve is in a state of spasmodic contraction due to chronic appendicitis or ovarian disease. In general the fomentation is highly useful in all cases of constipation accompanied by pain in the abdomen, no matter what the cause.

The best time for applying the fomentation is soon after breakfast, or shortly before the regular time for moving the bowels. Applications may be made with great advantage two or three times daily, or at least morning and night, so as to relax the colon several times during the day.

A hot fomentation to the abdomen for five to ten minutes, followed by a cold application for one minute, is an excellent means of stimulating peristalsis and improving the muscular tone. The cold application may consist of a compress of cold water, but the most effective method is to rub the abdomen with a smooth piece of ice. The effect of this application is increased by repeating the alternation two or three times in succession.

Electricity

While electricity is not a panacea for constipation, nor for any other disease, and it certainly is not able to accomplish a tithe of the miracles that have been attributed to it, it is, nevertheless, when skilfully applied, a valuable means for combating constipation.

As ordinarily used, by means of sponges held

in the hands and employing a current from a small buzzing faradic machine, nothing more is accomplished than a slight titillation of the skin and a small amount of pain, which may, however, in some cases, exercise a beneficial psychological effect.

When properly used, however, electricity may render valuable service in constipation in three ways: (1) By inducing automatic exercise of the abdominal muscles and so restoring their tone and strength; (2) by stimulating the colon itself and thus exciting bowel action; and (3) by restoring lost nerve sensibility to the rectum.

Automatic exercise of the abdominal muscles may best be administered by the aid of the sinusoidal electrical current. The static or faradic currents may be used, but they are more or less painful and less easily controlled. The sinusoidal current is practically painless. The most convenient method of using the current is by means of the automatic exercise apparatus, which may be adjusted so as to cause any desired number of vigorous contractions of the abdominal muscles per minute.

The colon is not excited to action by applications of electricity to the surface of the body, but it may be excited by the application of the bi-polar electrode to the inner surface of the pelvic colon, which is the region of greatest delay in the majority of constipated persons.

The services of an expert proctologist are needed for the proper placing of the electrode.

The application of the sinusoidal current to the rectum, by means of a proper electrode, is an effective means of stimulation when normal sensibility of the rectum has been greatly diminished or lost by neglecting properly to attend to Nature's "call." For this purpose the very rapidly alternated current is best. The applications should be made daily. The duration of an application should be about ten or fifteen minutes, and the strength of the current as much as the patient can bear without discomfort. Not infrequently the effect of the application is to provoke an immediate evacuation of the bowels.

Diathermy is a most interesting medical use of the so-called wireless electrical current. In the body the high frequency waves of electrical energy are wholly converted into heat, so that no electrical sensation or other sensation except heat is felt.

The special advantage of diathermy over other forms of heat applications is that the heat may be applied to the deepest parts as easily as to superficial parts. This is due to the wonderfully penetrating power of this current.

Diathermy is a valuable means to employ in the treatment of colitis. The application of the current to the spastic colon causes it to relax, and likewise relieves the pain in the colon as well as the back and other reflexly related parts.

The arc light and the photophore are measures of value in the treatment of spastic and reflex constipation. They are especially useful in cases in which pain is a pronounced symptom and a cause of reflex spasm. The applications should be made in the morning, or at night just before retiring.

The Enema

According to Pliny, the first writer on natural history, the use of the enema was learned by the Ancients from the stork, which was "observed to inject water into its bowels by means of its long beak." It is now known that this was an error of observation. The stork does not inject water into its colon, and probably has no occasion to seek relief in this way. The great bird, like many other feathered creatures, has near the anal region an oil-secreting structure known as the preen gland. What Pliny saw was the stork oiling its beak in preparation for preening its feathers.

But the use of the enema has been known from the most ancient times, and is employed by the most primitive tribes. The native of the Congo administers an enema to himself by lying down upon the ground and inserting into the rectum the perforated tip of a bison's horn filled with water from a nearby stream.

The modern enema syringe was devised about the time of the discovery of America by Colum-

bus. Within a century the enema came into such honor that the physician who attended Louis XIII thought it worth while to record the fact that he administered to the King two hundred and twenty enemas during the last six months of his life.

During the succeeding reign, that of Louis XIV, the enema became almost a rage in Paris. The court ladies and dudes discovered that by keeping the colon clean the complexion was improved, and so it became the fashion to take several enemas daily to keep the skin white and the complexion fresh. This was a shrewd observation, for the reason that the same thing that keeps the complexion fresh also keeps the liver, kidneys, heart and other vital organs free from the destructive influence of poisons, and keeps the mind young. Here is a hint to modern beauties who desire to preserve their good looks. A clean colon is worth for this purpose a ton of cosmetics.

Soon after the enema became so extraordinarily popular in the time of Louis XIV, the doctors turned this remedy over to the pharmacists, who later turned it over to the barbers, who at that time combined with their tonsorial duties cupping, bleeding, leeching and minor surgery, in addition to the giving of enemas and to the doing of sundry other medical "chores."

A number of years ago a New York charlatan made a fortune by selling what he termed

"Hall's Secret," which consisted of nothing more than a small pamphlet in which instruction, for which a charge of \$4.00 was made, was given about the use of the enema. Large numbers of persons testified to the rejuvenating effects of this simple treatment, which doubtless did some good, although probably many were injured by the large amount of water advised. Hall asserted that he made use of one gallon of water to fill and wash out the colon, which he did once a week.

The enema is still being exploited by charlatans in various ways, but is probably prescribed less often than it should be by medical practitioners.

There are unquestionably certain cases in which the colon has become so crippled by inflammations, stretchings, distortions, adhesions, and the degeneration of its muscular structures, and consequent weakening of its contractile powers, that it can no longer be made to perform its functions, even by the use of accessories that act as mechanical or physiological aids. In such cases and in certain emergencies, the judicious use of the enema is not only helpful but sometimes necessary. Some badly crippled colons require the daily use of the enema to secure complete clearance. In such cases the bedtime hour is perhaps the best time to use the enema, for this gives opportunity for normal evacuations to accomplish what they may.

How to Administer the Enema

The best means for administering the enema is the fountain syringe. The tube should be long enough so that the reservoir may be raised to a height of three or four feet above the patient.

The position of the patient during the administration of an enema is a matter of some importance. When the pelvic colon is low down in the pelvis, as shown by examination, it is well to put the patient in a knee-chest position. Ordinarily, however, the patient may lie upon the back or either side. The water quickly finds its way along the colon, no matter what the position of the patient may be. It is sometimes advantageous to lie for a few moments on the right side after the water has been introduced.

When massage accompanies the enema, it should be given while the colon is still filled.

The enema may be repeated as many times as is necessary to obtain results. It should be repeated as long as the water contains fecal matters when returned.

When the Enema is Harmful

Harm may result from the use of the enema if care is not exercised to prevent overdilatation of the colon by the use of too large an amount of water. The amount should not exceed two quarts. For greatest efficiency, the water should be introduced slowly, and little force should be

used. The temperature of the water should generally be about 110° to 115° F., or as high as possible without giving pain. When natural bowel movements begin, even though they occur two or three times daily, the enema need not be discontinued at once, but may be used every other day instead of daily. The enema should be continued as long as its use is followed by a considerable discharge of residues. When the amount of residues discharged with the enema is reduced to nothing, or is small, its regular use may be discontinued, to be renewed only when there is reason to believe that the colon fails to function efficiently.

Irritation of the anus, and sometimes hemorrhoids, may result from the frequent use of the enema. This may be prevented by lubricating the enema tube with carbolated vaseline, by cleansing the anal region with soap and water after each bowel movement, and by the application of carbolated vaseline or an antiseptic suppository of some sort to the anal canal after each bowel movement.

Care, before and after using, should be taken to cleanse not only the tip that is inserted, in taking the enema, but the whole tube, also the water container, into which fecal material may sometimes reflux.

When used in the manner above indicated, the enema may be employed for months or even years without injury.

For example, in cases of senile constipation, where, as the result of long-continued colitis the muscular walls are thin and greatly stretched, while the colon itself has become abnormally enlarged and folded upon itself, the daily or frequent use of the enema may be required. Such daily use of the enema is greatly preferable to the retention in the colon of putrid fecal matters even for a few hours.

The "High Enema" Seldom Useful

The use of the colon tube is quite unnecessary. Indeed, as the writer learned by experience long ago, and as has been abundantly proved by examination with the X-ray, the colon tube can rarely ever be introduced beyond the rectum. It is arrested at the pelvi-rectal fold, and simply returns and coils itself up in the rectum. A tube long enough to pass the water through the anus is as useful as the longest colon tube.

The so-called "high" enema is, moreover, in the writer's experience, never required. The colon itself is a tube, and water that passes within the anus will find its way to any point in the colon that can possibly be reached by a rubber tube, no matter how high it may be introduced. The experience of roentgenologists, in the administration of the barium enema in tens of thousands of cases, has demonstrated that when mechanical obstruction in the colon does not

exist, it is easily possible, in every case, to fill the cecum with liquid introduced into the rectum with an ordinary enema tube and without employing more than very moderate pressure.

Since the publication of the writer's "Colon Hygiene" (1912), a new, quasi-medical group has arisen composed of what might be termed "colon specialists." These persons are sometimes physicians, but much more often they are men or women who have had a certain amount of training as nurses or hospital assistants, but who have a very limited medical education. They are generally disposed to make greatly exaggerated claims respecting the benefits to be derived from having the colon washed out by some particular method of which each individual operator claims to be the originator. Special stress is sometimes laid by these persons upon the necessity for making use of some particular "tube," or other device, to which special efficiency is attributed.

Some good is doubtless accomplished by these empirics, for the majority of the persons who consult them are, without doubt, suffering from the effects of accumulated colon residues the removal of which is followed by more or less relief. Persons suffering from colon troubles should be warned, however, of the danger of placing themselves in the hands of unqualified specialists whose methods often are more liable to result in injury than benefit.

The Bedtime Enema

The use of an enema at night to empty the colon does not interfere with natural bowel movements, but encourages them. An enema at night often relieves insomnia by getting rid of troublesome gas, and by preventing the absorption of nerve-disturbing poisons.

It is sometimes well at bedtime to introduce into the rectum a pint or half-pint of lukewarm water, or a few ounces of mineral oil, to be retained overnight in cases in which the stools are dry and hard.

Different Types of Enemas

The Hot Water Enema. The temperature of the water should be 110° to 115° F. The quantity may be from one to three pints. This is preferable in cases of colitis or a spastic condition, and when abdominal pain or tenderness is present.

It may be desirable to use the enema daily, or even twice a day, and it may be necessary to continue the irrigation a half hour or longer.

In the treatment of ileal stasis, the first step is to empty the colon, which is often crowded full of the decomposing remains of a dozen meals or even more. The cleansing should be repeated until the whole colon is thoroughly cleared.

In many cases of prolapse of the pelvic colon, the daily use of the hot enema, preferably every

night at bedtime, is necessary to remove a residuum of fecal matter that always remains in these cases after natural evacuation.

It is a good plan for the patient to take every other morning a couple of carmin capsules, and then to note the following morning whether or not the red color appears in the morning stool. If the color appears, either with a natural stool or with an enema, it is clear that the colon was not completely emptied by the enema administered the night before. In this way the efficiency of the treatment may readily be determined. The red color from capsules given at breakfast should be wholly washed out by cleansing enemas at bedtime.

In rectal constipation, after the bowels have moved as much as they will, half a pint to a pint of hot water may be introduced to cleanse the rectum. This may be repeated as many times as necessary.

By this means the tone of the relaxed rectal walls may gradually be restored. In most cases the normal nerve sensibility may be restored also. Great care must be taken to prevent any accumulation of residues in the rectum. The slightest hint of a "call" must receive attention immediately.

The hot enema is also useful in colic pains. Heat is a most excellent antidote for pain. It also relaxes muscular spasm. In all cases of colic, apply very hot fomentations to the abdo-

men and administer a hot enema. Repeat the applications both of the fomentations and of the hot enema until the pain ceases, as it soon will do.

The hot enema relaxes the bowel and removes the fermenting food residues that give rise to the gas and hence are the real cause of the colic.

The flora should, of course, be changed to suppress the gas-forming germs, as will be later explained.

The Cold Water Enema. A cold application to the interior of the bowel is one of the most powerful means of stimulation that can safely be employed. Half a pint of water at a temperature of 50° F. will usually set up a very strong and painful contraction of the lower bowel. It is on this account necessary to begin with a moderate temperature. The first enema should have a temperature of 80° to 85° F. The temperature may be lowered on each application two to five degrees, or until sufficiently powerful contractions are produced to expel quickly the water introduced.

The Oil Enema. The amount of oil required is four to six ounces. Pure olive oil or other sweet oil is usually employed. The temperature of the oil should be 100° F.

Animal or vegetable oils slow the emptying of the stomach, however, much the same when introduced into the rectum as when taken by

mouth. On this account oil enemas are liable to cause loss of appetite and even nausea. The writer's attention was called to this fact many years ago by observations in a case on which he had operated for removal of a cancer of the stomach. The patient was nauseated whenever oil was injected into the rectum. A research, in which dogs were used as subjects, conducted by Boldyreff and the writer, showed that the effect of animal or vegetable oil on gastric secretion is the same whether introduced into the rectum or into the stomach. Mineral oils produced no effect in either case.

As a means of softening hardened feces, oil is no better than water; in fact, according to the writer's experience, it is less efficient. It is useful, however, as a means of lubricating the lower bowel, and when introduced at night it prevents hardening and drying of the feces. For this purpose four to six ounces of mineral oil give the best results.

When used for the purpose of lubrication only, a good plan is to administer the mineral oil before breakfast. This is an excellent means of securing a thorough evacuation of the colon.

The Lactose Enema. In cases of rectal irritation, a daily hot irrigation (temperature 110° to 115° F.), followed by the introduction of a half pint of starch water containing a teaspoonful of lacto-dextrin, is a simple measure that rarely fails to give relief. The starch water

is prepared by adding a heaping tablespoonful of cornstarch to a quart of boiling water.

When available, B-Lac, a new form of lactose, may be employed, as this milk sugar aids in combating colonic infections by encouraging the development of a protective aciduric flora.

Failure of the enema to return promptly is generally due to a spastic condition of the descending or pelvic colon. Repeated use of the enema at 110° to 115° F. will usually cause the bowel to relax.

The Acid Enema. The colon responds more naturally and vigorously to mild acid than to almost any other form of stimulation. This is due to the fact that under normal conditions the contents of the colon are acid. A putrefactive condition, in contrast, produces ammonia and other alkaline substances, which paralyze the colon.

When an enema is not promptly discharged, lemon juice added to the water stimulates peristalsis. For this type of enema, add to three or four pints of hot water the juice of one or two lemons. In the absence of lemons, a dram or two of lactic or of citric acid may be added to the water. It is necessary to make sure that the acid is completely dissolved and thoroughly mixed.

This type of enema is particularly useful when the colon is spastic, also in rectal constipation. The heat of the enema relaxes the con-

tracted bowel, while the acid stimulates the bowel to normal contraction without producing a state of spasm. This method often succeeds when other means fail.

The Glycerin Enema. One to four ounces of pure glycerin introduced into the rectum is a highly efficient laxative when the "call" is lost. If pure glycerin is found too irritating, dilute with an equal amount of water.

The Cold Rectal Douche. By introducing cold water into the rectum with considerable force, a most powerful stimulation may be produced. The temperature of the water should be 50° to 60° F. The stream furnished by the ordinary fountain syringe is usually effective. If necessary, a bulb syringe may be used.

In administering the rectal douche a return tube should always be used, so that the rectum will not be overdistended. A small tube should be connected with the syringe, and a large one should be introduced alongside it to prevent overfilling the rectum. It is not desired to secure the stimulation that results from distention of the rectum, but only to obtain the enlivening effects produced by a low temperature and the impact of a stream of water introduced with considerable force. It is well that the enema tube be introduced its full length and directed somewhat backward, so that the stream of water may be received upon the upper part of the rectum.

The effect of such an application is to produce almost immediately a very strong defecating reflex, with contraction of the pelvic colon and forcible expulsive efforts.

In cases in which the normal sensibility of the rectum is largely lost, this measure affords a very excellent means of restoring it. In extreme cases the hot and cold rectal douche may be employed.

PSYCHIC INFLUENCES

The colon is richly supplied with sympathetic nerves, and—like the face—is highly sensitive to influence from all emotions, pleasurable or the opposite.

Pleasurable emotions and excitement have been known to produce intense activity of the intestines, and even diarrhea. Unpleasant emotions of all sorts check peristalsis. Loss of sleep, business worries, domestic trials, harassment from any cause, may render the colon spastic and cause obstinate constipation. Anxiety, annoyance, apprehension or ill-temper, may stop all movement of the intestine, as well as of the stomach, together with gastric secretion. Professor Anderson, an eminent Danish physiologist, found that depressing emotions powerfully excite the sympathetic. In a dog placed in strange surroundings, peristalsis ceased for several hours. The effect is to raise nerve tension. The so-called "muscle tonus" is increased. The descending and pelvic colon may then become spastic, that is, strongly contracted. This condition of the colon renders impossible normal bowel action, and may even give rise to an exaggerated reverse peristalsis, by which the contents of the colon are carried backward through an incompetent ileocecal valve

into the small intestine, a condition often encountered in persons suffering from so-called neurasthenia, or "nervous prostration."

Pain in almost any part of the body may arrest intestinal action by causing a reflex interference. Pain or inflammation in any part of the abdomen, especially such painful affections as chronic appendicitis, inflammation of the bladder, prostate, uterus, ovaries and other pelvic organs, may give rise to inaction of the intestine, not only by inhibiting or preventing peristalsis, but also by causing obstruction through contraction of the ileocecal sphincter. The pain and irritation of an ulcer or fistula, or of inflamed hemorrhoids, may induce constipation by causing spasms of the anal muscle and thus preventing the normal relaxation for the act of defecation.

The angry colon shuts up like a clam and declares "no thoroughfare here." Cannon, studying the intestinal movements in the cat by the aid of the X-ray, observed that all movement instantly stopped when the cat's tail was pinched, causing her to "spit" in resentment. The intestinal activity was resumed only when the effect of the irritation had passed away.

While some persons are obstinately constipated because of a chronic state of ill will or anger, constipation may, on the other hand, promote these emotions. It is recorded that Cromwell's bowels had not moved for a week at the

time he caused King Charles to be beheaded, and that the theologian, Calvin, was in a similar state when he signed the death warrant that sent Servetus to the stake. It is recorded that Voltaire was at one time so despondent that he remarked to a friend that he had resolved to hang himself. The friend called next day, anxious to know what had happened, and was delighted to find that a complete revolution had taken place overnight. Voltaire met him with a smile and the simple explanation, "I have been well washed out."

Grief shuts up the outlet of the body's sewage system as tightly as does anger.

Fear and Worry

The worried colon neither secretes nor contracts. Both secretion and contraction are needed for efficient action—secretion for lubrication and contraction for transportation of the food residues to the exit. The frightened colon cannot discharge its contents because the descending part is in a spastic state. The depressing influence of fear is well established by the "rice ordeal," long in use in India for the detection of the guilty one among a number of suspected persons. A portion of the sacred rice is placed in the mouth of each one. After a few minutes the rice is removed and placed upon the sacred fig leaf. The rice from the guilty one is dry—a physiological proof of his criminality.

An X-ray examination would show his colon as well as his salivary glands to be inactive.

Morbid anxiety about the health, called hypochondriasis, may interfere with normal intestinal action. So long as the patient is fearful that his bowels will not move, they have difficulty in doing so. The colon is in a state of stage fright. The most effective remedies—such as bran and mineral oil—may not move the bowels until the element of fear is removed.

The automatic functions of the body are interfered with when the mind is concentrated upon them. This is the cause of stuttering. The stammerer's impediment of speech disappears as soon as he forgets about it. Similarly, the action of the colon may be impeded by a too-concentrated attention. This psychic law is very well illustrated in the fable of the unhappy centipede:

"A centipede was happy, quite, until a toad,
in fun,
Asked, 'Which leg comes after which,
when you begin to run?'
This wrought his mind to such a pitch,
He lay distracted in a ditch,
Uncertain how to run."

How Faith Cures

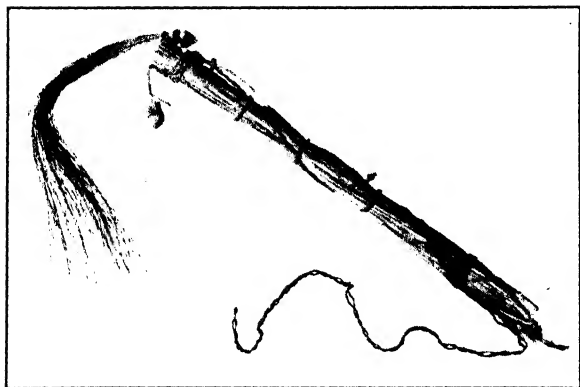
Confidence and faith may change the situation. Christian Science, Couéism, "faith healing," a fetish, a "liver pad," a "magnetic"

suppository, anything that abolishes fear and establishes faith and optimistic expectation, often effects a cure when fear is the only difficulty.

The African savage, when he is constipated, touches a fetish prepared for him by a witch doctor. The accompanying cut shows a fetish, employed for this purpose and presented to the writer by a friend, Doctor Stauffacher, for many years a medical missionary in the Zambezi region. The fetish is hung on a tree close to the path that leads to the retiring place in the nearby jungle. As a native passes, he touches the fetish and straightway his bowels are ready to move. When the writer remarked, "Of course the constipated patient soon finds that the fetish is useless," the doctor replied, "But it works, it really works remarkably well, and is in very general use." It is possible that the "liver pads" of a generation ago may have "worked" by the same psychologic principle.

In view of these facts, which might be multiplied at great length, it is evident that a right mental attitude is essential for the successful treatment of a sluggish colon, just as is roughage, lubrication, etc. With the laxative diet and various food accessories must be mingled the firm faith that the natural and biologic means employed will accomplish the desired object.

Such a faith will lead to regular visits to the toilet at the times when the bowels should



A Congo Fetish—Famous as a Cure for Constipation

move; that is, after each meal, on rising in the morning and on going to bed at night.

Careful Training of Children Necessary

From early infancy the habit of prompt attention to the "call" for evacuation of the colon should be cultivated assiduously. Instead of doing this, the mother usually subjects the little one to a process of house-breaking much like that to which house dogs are trained. As soon as the child begins to run about, the mother begins to train the child to restrain the movements of the bladder and bowels to suit convenience of time and place.

A false sense of modesty also becomes a restraining influence. It soon upsets the normal intestinal rhythm and lays the foundation for lifelong stasis and constipation and all the miseries associated with these conditions.

It is the duty of every physician and of every trained nurse to do all possible toward the enlightenment of the chronically sick with whom they come in contact in relation to the absolute necessity for frequent and complete bowel action and of an aciduric flora. Mothers and school teachers should give the matter special consideration. They should make sure that each child under their supervision forms correct and regular habits in relation to evacuation of the bowels, and maintains by the proper diet a non-putrefactive condition of the residues.

WHEN IS SURGERY NEEDED?

The successful treatment of alimentary toxemia often taxes to the utmost the resources of the best-equipped physician.

Various opinions have been expressed by eminent medical authorities respecting the indication for surgical relief in cases of obstinate constipation. It may be said, however, that at least nine-tenths of the possible benefits to be derived from treatment—in cases other than those of acute infection, as previously described, and in which surgery may become imperative—are to be secured by the relief of stasis or stagnation, and by changing the flora and thus combating toxemia. By such regulation of diet and habits as to secure a thorough evacuation of the bowels at least three times a day, or after each meal, and by excluding from the diet flesh foods and other putrescible substances, also by the use of lactose for maintaining the dominance of acid-uric organisms, more can be accomplished toward eliminating from the intestine pernicious parasitic organisms and the multitudinous poisons that they produce than by any other means.

Cases are really very rare in which the flora cannot be changed and the changed condition maintained by proper regulation of the diet and the use of the simple measures that have been



Prolapsed and Adherent Pelvic Colon



Pelvic Colon Restored to Position
by Operation

suggested. But now and then a case will be encountered in which surgery must be resorted to.

Adhesions

Chronic as well as acute appendicitis is a condition that may open the way for relief of constipation by removal of an active cause. This is especially true when X-ray examination shows about the inflamed appendix many adhesions that fix the cecum so that it cannot empty itself, or that cause obstruction at the lower end of the small intestine. The necessity for operation may exist in cases of this sort, even when little pain is felt in the region of the appendix.

Not every case in which such adhesions exist requires operation, however. By far the great majority of such cases may be substantially relieved by non-surgical measures.

Adhesions of the ascending or descending colon, and especially adhesions that compress the pelvic colon and limit its movements, may be relieved by appropriate surgical procedures when other means fail.

These cases seldom require removal of the colon or any portion of it, or even the so-called short-circuiting operation. This affords only very temporary relief unless care is taken to restore the ileocecal check valve.

The Crippled Pelvic Colon

When adhesions of the pelvic colon are broken up, the bowel must be suspended by

attaching it by means of sutures to the underside of the omentum to prevent the reproduction of the restricting adhesions that will almost certainly recur unless some efficient means of prevention is adopted. The omentum is in turn attached to the abdominal wall at a point higher up. This swinging attachment enables the bowel to function in a perfectly normal way, and gives the patient no inconvenience. This operation is known as transomental suspension of the pelvic colon.

The lining of the abdominal cavity, the so-called parietal peritoneum, is highly sensitive; and when a loop of intestine is adherent to it, pain is experienced whenever the bowel moves in such a way as to make traction at the point of attachment.

In some scores of cases in which this operation has been performed, the relief has been complete and immediate.

It should be noted that the bowel is *suspended* by the omentum and is not attached directly to the abdominal wall. The latter operation rarely succeeds, and causes so much pain that a second operation to release the bowel is often necessary. The accompanying stereoradiograms show the appearance of the colon before and after the operation.

Operations Often Rendered Unnecessary

In the majority of cases, however, no operation is required if the patient will change the intestinal flora and keep it changed. Absorption of the adhesions may take place in certain cases after the flora has been changed and the colitis cured. Absorption of adhesions, as well as the cure of the colitis always present in these cases, is promoted by the persistent use of the hot enema (110° to 115° F.).

In many of the cases in which the short-circuiting operation and colectomy have been performed, the chief cause of stasis has, in the writer's opinion, very probably been a spastic condition of the descending or pelvic colon, which in by far the majority of cases is in turn the result of infection. With change of the intestinal flora and proper regulation of the diet, this spastic condition practically always disappears unless due to extrinsic causes, which must of course receive attention.

These cases have fallen into the hands of surgeons because of the highly irrational method of treatment to which they are almost universally subjected by internists, who seem in general to have overlooked two very important facts to which von Noorden many years ago called attention: First, that cathartics and laxatives of all sorts, including mineral waters, make these patients worse and are an active cause of the

colitis that very commonly coexists with spasticity; and second, that a bland diet is not only not indicated in these cases but is most decidedly contraindicated. Von Noorden proved, and the experience of the writer and his colleagues confirm his observations, that the spastic state of the bowel is not due to mechanical irritation but to reflex irritation, to a local chemical irritant or to a local lesion. In the great majority of cases the real cause is without doubt to be found in the toxic influence of the chemical products of putrefaction, which set up a local irritation and thereby induce a spastic state of the bowel. The exclusion of bran, coarse vegetables, fruits, etc., from the diet in these cases, which has been the almost universal practice, is a gross error. Such a diet encourages intestinal stasis and so ultimately aggravates the condition. By changing the flora, the irritation of the putrefaction products is rapidly eliminated. By the free use of roughage with mineral oil as a lubricant, a very highly spastic colon in a short time resumes its normal condition and begins to function in a proper manner.

Is Repair of the Ileocecal Valve Needed?

Incompetency of the ileocecal valve is sometimes accompanied by the most incorrigible constipation, and by most pronounced intestinal toxemia, as shown by enormous quantities of indican and other putrefactive products in the

urine, and by intractable headaches. This condition is regarded by some eminent surgeons as an indication for surgical repair of the valve.

When this operation was devised by the writer some years ago (1911), the efficient methods for changing the intestinal flora now available had not been perfected. The operation was performed in more than 250 cases, with results generally satisfactory and sometimes so striking as to be almost sensational. The present methods of changing the intestinal flora have been found so efficient, however, that the operation is now seldom found necessary. When the flora is changed, the mischief that ordinarily results from reflux of residues from the colon into the small intestine does not appear. The suppression of virulent pathogenic organisms in the intestinal contents renders them harmless, so that the failure of the valve to prevent the escape of material from the colon into the small intestine is no longer a matter of such serious moment.

Furthermore, when normal activity of the bowel is maintained, reflux into the ileum is very much less likely to occur, so that the writer has practically abandoned this operation except in cases in which removal of the proximal colon is necessary on account of cancer, tuberculosis or some condition that cripples it so badly that it cannot be made to function properly even by changing the intestinal flora.

Obstructions

Constipation due to organic obstruction resulting from stricture, tuberculosis, cancer or other morbid growths, necessarily requires surgical interference, and a surgeon especially experienced in intestinal surgery should be consulted. This is important, for in surgery of this character results depend almost wholly upon exactness and perfection of technic, such as can be gained only by long and extensive practice.

Acute obstruction due to intussusception or "telescoping" of the intestine requires immediate surgical attention. If obstruction occurs due to diverticulosis, an experienced surgeon should be called at once.

Unless the symptoms are extremely urgent, however, a thorough effort should be made to secure relief by the measures necessary for the cure of constipation and a change of flora before resorting to surgery. Operations for kinks, for prolapse of the colon, dilatation of the cecum and like conditions, and especially removal of the colon and the short-circuiting operation, are now very rarely justifiable.

Sometimes the processes that begin in the intestine and work outward through the intestinal wall give rise to inflammatory changes in the membranous fold of mesentery to which the pelvic loop of the colon is attached. As a result, the mesentery is gradually shortened until the

ends of the loop are brought close together and fixed. With the colon in this position, there is a great risk of obstruction from the twisting of the loop, which occasionally happens, giving rise to what is known as volvulus. In a case of this kind, prompt surgical relief is very essential. A short delay may give rise to gangrene of the intestine and general peritonitis.

Rectal Prolapse

In cases of prolapse of the rectum, frequent movements of the bowels are necessarily avoided on account of the inconvenience involved. These cases may be cured by a simple and safe surgical procedure. Such an operation should be the first step in the effort to cure the chronic constipation present. After the operation, all the measures for correcting constipation and a putrefactive flora are indicated.

A PRACTICAL PROGRAM

While individual types of constipation require special measures of treatment, the main features of the rational method of dealing with the crippled colon are essentially the same for all.

The following is a summary of those measures that the writer has found efficient in dealing with many hundreds of crippled colons:

Summary of Measures

1. *Motility Test*.—Before beginning treatment, the degree to which the colon is crippled should be determined by the use of a marker. Charcoal or carmin may be employed; carmin is most efficient. Proceed as follows: At breakfast take two 5-grain capsules of carmin. The effect will be to give the residue of the meal a bright red color. After taking the carmin, watch for its appearance in the stool. It is not likely to appear at the first bowel movement, but it may appear at the second or third. Not infrequently a trace of carmin appears within 9 or 10 hours after it is taken. If the bowels are badly crippled, the carmin may not appear for more than 24 hours.

While it is worth while to note the time of the appearance of the carmin, it is of great

importance to observe the time of its disappearance. One or two stools may be entirely colored red. In later stools the red color may appear in patches. The time when the red color last appears should be carefully noted. The time that has elapsed since the carmin was taken is the measure of the intestinal motility; that is, the length of time the food and its residues have remained in the alimentary canal. Normally the carmin should appear and disappear within 24 hours. In cases of chronic constipation, the carmin is often seen two or three days after taking and sometimes much longer.

This carmin test should be repeated at first once a week. It is a reliable means of checking the progress that is being made under treatment. Later, when conditions are improved, the test may be employed less frequently, say once a month. This method of testing the intestinal motility is practically as exact as the X-ray and barium meal method.

2. *A Fair Start*.—After the carmin test is completed, as the first step toward training the colon to act in a normal and efficient manner, it is a good plan to give the colon a fair start by thoroughly washing it out by means of the enema. Much time is gained by doing this, and much inconvenience is often avoided. Not infrequently a blockade of accumulated residues exists in some part of the colon. Sometimes the colon is packed completely full with inspissated

fecal matters, which can be removed only by mechanical means. The best time for administering the enema is just before retiring at night.

The enema should consist of two quarts of water, at a temperature of 110° to 115° F. It should be introduced slowly. Plenty of time must be given for evacuation. In order to insure complete clearance of the colon, a second enema may be taken after the first has been evacuated, and if necessary a third, or even a fourth, or more. The writer recalls one case in which nine enemas were administered in succession, each one bringing away more or less fecal matter. With the last enema was evacuated a considerable quantity of dark colored, very foul smelling material, which had evidently been retained in the upper part of the colon for some days or possibly weeks. Emptying the colon of these obstructive accumulations gives the crippled colon a better chance to begin functioning in a normal manner by the aid of the various helps to be given it. After the bowels begin to move voluntarily two or three times a day, the bedtime enema may be employed less often—every other day or twice a week. Where little or no residue is found in the colon, it may be omitted, to be resumed, however, whenever there is evidence of an accumulation of residues. It should be made a rule never to retire with a loaded colon.

3. *The Laxative Diet.*—First of all, the diet

must afford a considerable amount of ballast or roughage, that is, indigestible material, which by giving bulk to the intestinal contents will stretch the muscular walls of the intestine and so stimulate peristaltic activity. Such a diet will consist of whole grain preparations, such as cracked wheat, shredded wheat, cooked whole-wheat, oatmeal, and brown rice; fresh vegetables, especially spinach, lettuce, carrots, cabbage, beets and other garden stuffs; fresh fruits, particularly apples, figs, prunes and berries of all sorts. A liberal amount of raw or uncooked foods in the form of simple salads should be eaten daily, better twice a day. Butter and vegetable fats such as olive oil, ripe olives, etc., should be eaten in reasonable amount at each meal. The food must be tasty, stimulating to the palate and satisfying. Savita, a tasty extract of yeast, is useful not only because of its agreeable meaty flavor, but because it is rich in vitamin B, which McCarrison has shown to be an efficient means of energizing the intestinal canal.

4. *Things to be Avoided.*—While it is of the utmost importance to eat certain foods, it is almost equally important to avoid certain other foods. In the taboo class must be placed fine flour products, polished rice and other denatured cereals. Meats of all sorts, fish, flesh and fowl, are constipating and may with great advantage be dispensed with. Pepper, mustard,

pepper sauce, all hot and irritating condiments, must be strictly avoided. Tea and coffee contain much tannic acid and are decidedly constipating. Kaffir tea is free from both caffeine and tannic acid and hence is harmless. In place of tea and coffee, hot fruit juices or hot Savita broth may be used with satisfaction. Cane sugar and candy should be used very sparingly if at all; their free use is highly injurious. B-Lac, the new health sugar (beta-lactose), and confectionery prepared from this sugar, may be used freely without injury, and it is a very satisfactory table sugar. Tobacco in every form, and also alcohol, are highly detrimental to the intestine and must be strictly avoided.

5. *Laxative Food Accessories*.—Our staple foods are so much denatured that they leave in the colon an insufficient amount of residue to stimulate a normal degree of activity. Besides this, the crippled colon requires much more vigorous stimulation than the normal colon. Hence it becomes necessary to make use of substances that are devoid of nutritive qualities but which render great service in assisting the crippled colon to function in a normal manner. The most valuable of all intestinal helps of this sort is psyllium seed, a new product, native of the Orient, and one that has only recently become available. One or two dessert-spoonfuls should be taken at each meal. Bran if taken in liberal quantity, one or two tablespoonfuls at each meal,

is sometimes efficient, but psyllium seed is usually much more efficacious and dependable. Agar-agar, a tablespoonful at each meal, is sometimes found efficient, but it is less dependable than either psyllium seed or coarse bran. Combinations of bran with agar-agar (Laxa), or with fruit (Fig-Bran), are highly satisfactory.

Mineral oil is highly valuable for lubrication. For real efficiency it must be taken at each meal. The pure oil is more efficient than the emulsions. The most efficient of all is the solid mineral oil known as Paramels, one tablet at each meal. In mild cases of constipation some one of the remedies mentioned taken at every meal will be found efficient. Not infrequently combinations of two or more are found necessary for complete success. The best combinations are psyllium seed and Paramels, or psyllium seed, bran (Fig-Bran or Laxa) and Paramels. If not successful, increase the dose from day to day until the desired result is obtained.

Too much stress cannot be laid upon the importance of using these accessories regularly, that is, at every meal. Boldyreff has proved that mineral oil does not interfere with the digestion, as wrongly claimed by some writers.

6. *Thorough Chewing*.—Tasting and chewing of food are efficient means of stimulating the colon to action. On this account food should be eaten slowly and well masticated.

7. *Tri-Daily Evacuations*.—The colon should be trained to evacuate its residues three times a day. Visits should be made to the toilet after each meal, even if at first no desire for bowel movement is experienced. If the measures above indicated are faithfully carried out, the habit of tri-daily evacuations will soon be established.

8. *Regular Meals*.—To insure regularity in evacuations, the mealtimes should be regular. If a meal is necessarily omitted, fresh fruit should be taken, if possible, to aid in keeping up the rhythm. Or, a dose of psyllium seed, with or without mineral oil, may be used with advantage.

9. *Change of the Intestinal Flora*.—The intestinal flora should be changed by the use of Lacto-Dextrin. Two to four ounces of Lacto-Dextrin should be taken three times a day. The size of the dose may be diminished if beta-lactose (B-Lac) is freely used at the table in place of cane sugar. A thorough change of flora requires that meat should be discarded and that eggs should be used sparingly if at all.

10. *Supplementary Meals*.—A lunch consisting of fresh fruit, with lettuce, cabbage or some equally simple raw food, may be taken between meals for the purpose of encouraging colon activity when this seems necessary. A couple of apples or oranges eaten a half hour before retiring is an efficient means of securing an evacuation before going to bed.

11. *Don't Hurry.*—When visiting the toilet take plenty of time. Give the colon an opportunity for complete evacuation. The colon often discharges its contents in two installments; the second may follow the first at an interval of one to five minutes. Sometimes still a third installment is brought down after the lower bowel has been cleared. If these belated residues are not evacuated, they are liable to become so dry and hard before the next evacuation as to constitute an obstacle to efficient bowel movement. Prolonged contact with the mucous membrane of the colon in time gives rise to colitis.

12. *The Toilet Seat.*—The conventional toilet seat encourages constipation. The normal posture during evacuation is squatting. In this position the thighs press against the abdomen and aid the colon in expelling its contents. The toilet seat should be low enough to allow of at least a semi-squatting position. A stool five inches in height placed in front of the seat as a rest for the feet remedies the difficulty. An improved toilet seat constructed under the direction of the writer is provided with an anal douche by means of which a jet of water is thrown against the anal region for promoting cleanliness and thus preventing the development of hemorrhoids, fissures and other anal troubles.

13. *Water Drinking.*—Two or three pints of water should be taken daily. More is required when the skin is unusually active. A good plan

is to drink a glass of water whenever the bladder is evacuated or the bowels move.

14. *Exercise*.—Take the following exercises three times a day: Lie on the back with the clothing well loosened. Raise the legs from the horizontal to the vertical position, holding the legs straight, and then return to horizontal, taking a deep breath at the same time. The movement should be executed in four seconds, counting two while raising the legs and two while lowering. Execute the movement 10 to 30 times, increasing the number as the muscles become stronger.

Another excellent exercise is to lie on the back, draw up the knees and then execute the movements of riding on a bicycle. Breathe slowly and as deep as possible.

Still another excellent abdominal exercise is lying on the back and raising the legs while held rigid, in alternation, one going up while the other is coming down.

Walking at a smart pace and swimming, as well as all sorts of athletic games, are good means of encouraging bowel movements.

15. *Correct Posture*.—Relaxation of the abdominal muscles encourages stagnation in the colon. The muscles should be kept tense by carrying the chest high and to the front, holding the hips back when standing or walking and keeping the abdominal muscles well drawn in. In sitting, the body should never be allowed to

slump. The small of the back should be supported in such a way as to hold the chest up. When the abdominal muscles are much relaxed so that there is sagging of the viscera, as shown by bulging of the lower abdomen, it is well to sleep lying on the face with a small and rather firm cushion beneath the lower abdomen. The use of the perfected posture chair (see page 310) will be found helpful.

16. *Don't Worry*.—Worry, anxiety, all depressing emotions, tend to produce a spastic condition of the descending colon and thus to prevent bowel movement. Good cheer and laughter promote bowel action as well as good digestion.

Treatment of Specific Types of Constipation

Simple Constipation.—In cases of simple constipation, careful following of the above measures will result in marked improvement within a few days, and, if the effort is continued, will ultimately afford complete relief. It must be remembered, however, that the improvement will continue only so long as the remedial measures are faithfully employed. If within a reasonable time substantial benefit is not experienced, this fact may be regarded as evidence that the case is not one of simple constipation but involves important factors that have been overlooked. An X-ray study of the alimentary tract

by the aid of the barium meal and the barium enema should be made by an expert. Such an examination should reveal the nature of the difficulty, and so lead to the application of the appropriate remedial measures.

Rectal Constipation.—In the treatment of rectal constipation, it should be borne in mind that the principal obstacle to bowel movement is the undue accumulation of fecal matters either in the pelvic colon or in the rectum, or, as is most often the case, in both. In many cases the food is carried from the stomach to the colon with a proper degree of rapidity, and the feces move at the normal rate through the colon until they have passed the splenic flexure. At this point the delay begins. In time, through extraordinary neglect, when the feces are allowed to accumulate for days and even weeks in succession, the colon and even the small intestine may become enlarged through the obstruction at the outlet.

The chief cause of rectal constipation, in ordinary cases, as has already been pointed out, is neglect to attend to the "call" of Nature for the evacuation of the bowels. When the "call" occurs, it is because the rectum is distended with feces.

If the defecating mechanism is interrupted in its action, and its purpose thus thwarted, the "call" becomes less intense and the effort to defecate is so slight that it is easily suppressed. Later, in the worst cases, the desire to evacuate

the bowels entirely disappears. In these cases the sensibility of the rectum has become blunted to such a degree that the normal reflex is lost. The rectum tolerates the presence of feces without protest and without giving any signal to the defecating center that bowel movement is required.

It is evident, then, that in the treatment of cases of rectal constipation the first and most essential thing is restoration of the normal sensibility of the rectum. It must be remembered, however, that in most cases of rectal constipation, as well as in other forms of constipation, the condition has existed for a long time and has consequently extended to the entire colon, and perhaps to the entire intestine, and success will not be obtained by attention to the colon and rectum alone. Consequently, the treatment of rectal constipation requires the use of all the measures that have been recommended for simple constipation.

The first thing to be done in beginning the treatment of rectal constipation is thoroughly to evacuate the lower bowel and rectum. This is best accomplished by the use of the enema. It is certainly irrational to administer a laxative or cathartic, which disturbs the alimentary canal through its whole length, for the purpose of removing an obstructive accumulation that perhaps lies within six inches of the lower outlet.

A simple water enema at a temperature of

104° to 110° F. should be given to soften the hardened feces, and should be repeated until the colon is completely emptied, as shown by the return of clear water. The addition of soap to the water sometimes hastens the softening of very hard fecal matter. Warm oil has been much recommended, but it dissolves hard feces less rapidly than water. At first it may be impossible to introduce more than a small quantity of water, on account of the extreme distention of the rectum and pelvic colon with feces. By persevering effort, however, success will be attained. As the hard feces are gradually softened and dissolved, larger quantities of water may be introduced, until the whole colon may be filled with water and emptied of its putrefying contents.

In cases of impaction in which the fecal accumulation has been going on for several weeks, the patient must be put in charge of an experienced nurse. Sometimes the services of a physician are needed. When the feces are very hard, warm oil should be used to lubricate the walls of the bowels, which, in such cases, are often dry and sometimes roughened.

After the colon has once been cleared of residues, care must be taken to prevent recurrence of rectal impaction. To insure against this and to aid the rectum in recovering its function, a small hot enema (105° to 115° F.) should be administered after each bowel movement. An

effort should be made to move the bowels regularly after each meal, by the aid of the enema if necessary. After the bowels have moved, a pint of water at 70° to 80° F. should be introduced into the rectum to wash out any residue that may remain. Both very hot water and cool water have a tonic effect upon the nerves and muscles of the rectum, and help to restore normal sensibility. Gradually the amount of water employed may be diminished. The enema may be employed once a day, before retiring, instead of at each visit to the toilet. Later the evening enema is taken two or three times a week, and finally is omitted when residues cease to accumulate in the rectum.

When the gaseous distention or a sense of fullness in the lower abdomen suggests an accumulation of residues in the colon, the cold lavements of the rectum should be preceded by a large hot enema (two quarts, 110° to 115° F.) for the purpose of emptying the colon.

Electrical applications to the rectum, especially the sinusoidal or the high tension currents, are sometimes beneficial, but these measures are much less effective than cool or cold irrigation. The cool sitz bath (65° to 75° F.) for ten minutes is another hydriatic measure of value.

Of greatest importance is prompt, circumspect attention to any inclination to bowel movement that may appear, however slight it may be.

The returning "call" is at first an almost imperceptible sensation, a bare whisper, so to speak. If it is never ignored but receives prompt attention, it will increase in vigor from day to day until in time the natural prompting to bowel evacuation will be completely restored.

When the rectum is dry, an ounce or two of mineral oil should be introduced at night on retiring. Ordinary mineral oil may be employed, but a special mineral oil preparation which melts at the temperature near that of the body is greatly preferable. The use of small quantities of this solid mineral oil (Paramels) at each meal is the most effective means of lubricating the intestinal tract.

Spastic Constipation. First of all, employ all the measures recommended for simple constipation. In addition, the following measures should be employed for relief of pain and to overcome bowel spasm, which may be either constantly or intermittently present:

The most effective means of combating muscular spasm is heat. It may be applied in several ways. The most effective methods are the hot enema, hot applications to the abdomen (fomentation, photophore, hot water bag, arc light and hot spray), the hot sitz bath and diathermy. The best time for these hot applications is at night just before retiring.

In severe cases, a hot application of some sort before each evacuation is desirable for relaxing

the contracted bowel. A hot enema is the most effective means. In severe cases a combination of hot applications, internal and external, is found most effective. In these cases the cause of the spastic contraction is usually infection of the intestinal mucous membrane, or colitis, which must be eliminated by changing the intestinal flora. Sun baths, out-of-door life, fresh-air sleeping, and all measures calculated to build up the general health, are of course of the utmost importance and must not be neglected.

In latent constipation, the aim of treatment is not to increase the frequency of bowel movement, but to increase colonic efficiency so that the colon shall be kept free from accumulations of residues. An accumulation of putrefying residues is always present in some part of the colon, usually in the right side. All the measures recommended both for simple and for spastic constipation should be applied in the most thoroughgoing manner. Special attention must be given to changing the intestinal flora. A hot enema should be administered twice daily and just before retiring. After the number of bowel movements has been reduced to normal (three a day) and the stools are no longer putrid, only one enema should be administered. This may be best taken at bedtime. This plan will give opportunity for a natural bowel movement after breakfast.

Mixed Cases. In most cases of constipation, there is a mixture of types requiring a corresponding combination of methods of treatment.

When mechanical hindrance, due to adhesions or to morbid growths, is found to exist, surgical treatment and the services of a trained specialist are required.

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